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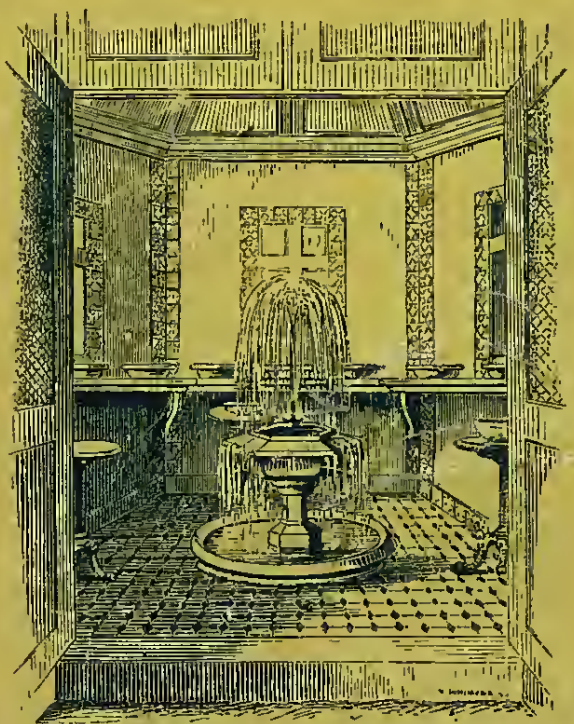
DAIRY HUSBANDRY AND CATTLE BREEDING.

By M. M. MILBURN,

AUTHOR OF PRIZE ESSAYS OF THE ROYAL AGRICULTURAL SOCIETY.



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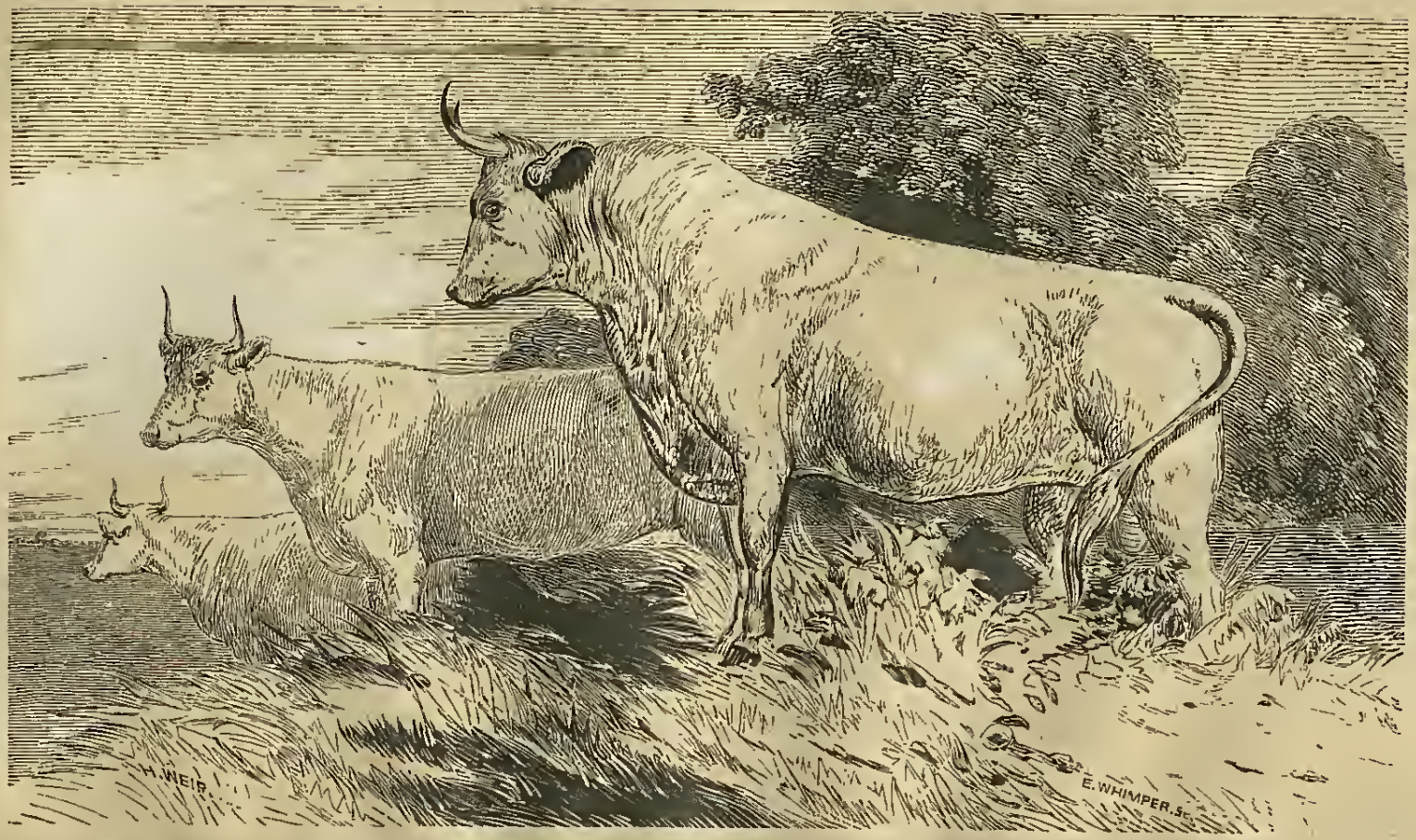

WILD CATTLE AT CHILLINGHAM PARK.

B. C. De Horne Nov 26. 1853

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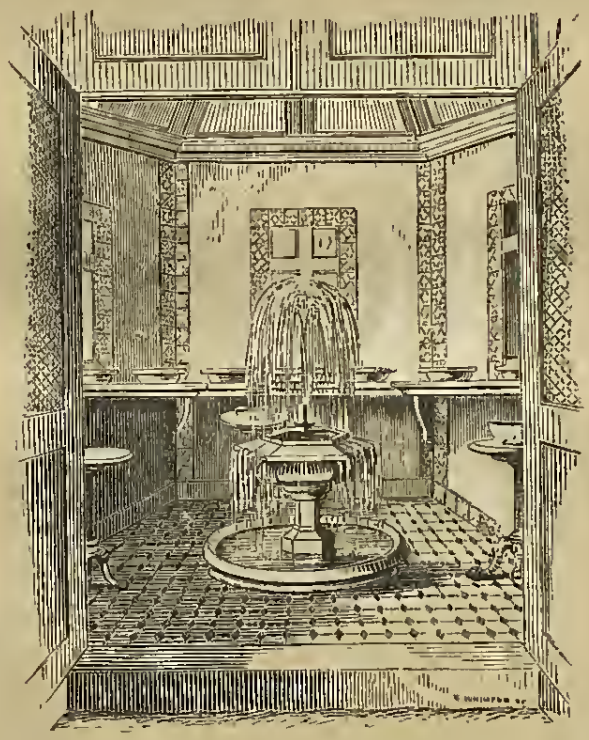

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DUBLIN: J. McGLASHAN, SACKVILLE STREET.

PREFACE.

The writer of the Cow has gone over the first edition of the Work, and made a few alterations, and several additions, which he believes brings the Book up to the present standard of knowledge. To those who have favoured him with their very flattering encomiums, both in the public press and also in private, he begs to say he has spared no pains to make the present edition of the Treatise as useful as possible to the Breeder, the Feeder, and the Cow-keeper.

Having undertaken to prepare for his Publishers a similar Treatise on the Sheep, he ventures to assure his readers that the same care will be exercised, and everything he knows communicated, connected with the Flock and Shepherding. In preparing this work much valuable information which he possesses on the Management of Sheep in Australia will be communicated.

M. M. M.

Sowerby, Thirsk, *October* 5, 1852.

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THE COW:

DAIRY HUSBANDRY AND CATTLE FEEDING.

CHAPTER I.

INTRODUCTION.

To no race of animals is man more deeply indebted than to the herd of the field. They not only cultivate the land like the horse, but supply him with food in various ways; and even after death they furnish him with many of the important necessaries of life. While living they provide him with milk, cream, cheese, and butter; and after death (unlike the noble horse, which dies but for the maggots and the hounds), they supply the food which has become associated with our national peculiarities, and which is one of the most nutritious of the aliments of life.

Their hide provides shoes for our feet, and trappings for our horses; their horns, combs and ornaments; their hoofs supply glue and gelatine; while their bones afford the handles for our knives and many useful articles of manufacture. The refuse of these, again, returns to the soil as a valuable manure.

From the earliest periods of antiquity the herd of the field have had attached to them a high degree of importance. In Egypt, the most civilized country of the earth, divine honours were paid them, and they had their priests and their obsequies. Even where a more enlightened faith prevailed, they were among the first religious sacrifices offered to God, and the first accepted. The herdsman, too, as well as the shepherd, was a patriarchal king, and his riches chiefly consisted of cattle.

It is not certain when cattle were first introduced into this island. Whether they inhabited it when it was severed from the continent of Europe, or whether they were brought from abroad, is absolutely unknown. Neither have the disputants at all determined which of the tribes of cattle that now exist had the honour of being the

primeval race. Nor can it perhaps ever be finally determined whether, if introduced, they came over in a state of domestication. One thing, however, is certain, that we have in this country several very distinct tribes of animals—differing in their features and characteristics in many very important particulars; some so completely domesticated as to be affectionate and even companionable, and others as shy and untameable in their nature as the wild deer of the forests. Neither is it easy to say whether the latter are the primitive race, or whether they are an accidental variety, permitted to live in their native wildness as a contrast to the gentle domesticated creatures such as our short-horns, which probably owe their docility to continental training, through a long series of ages.

Tracing our domestic breed back to the Bison, or Wild Ox, known to the ancient Greeks and Romans, but driven away from central Europe by the pressure of population, we find they now inhabit the wild morasses and forests of Lithuania and the Circassian range; where they appear so wild and ferocious as but little to resemble, except by marks too unmistakable to overlook, the quiet and gentle kine, which low around our homes with a social attachment. Attempts to domesticate them have been hitherto unsuccessful; and, when partially effected, as it has been by Gilberts, they still seem to have an aversion to our domesticated cattle, which is highly indicative of their half educated state. The bison is found also in British India, in Western Asia, and on the American continent. The race is hunted in most of those countries for their skins, and now, perhaps, for their flesh and their bones.

The herds of those bisons are usually very formidable in numbers. They associate together for mutual protection. Observing almost military discipline, they move in rank and file, and are led by the largest and fiercest bull. So dense is their column when migrating, that, if one falls or halts, the whole herd will march over him, and trample him to death. So well known is this habit of following their leader, that the hunters take advantage of it. An Indian, attired in a bison's skin, places himself between the herd and a precipice, while his coadjutors nearly surround the herd on the three other sides. At a given signal they appear simultaneously, and set up a tremendous yell. The herd, seeing no other way open, scamper off in the direction of the disguised bison, who leads the way to the precipice, and retires to some previously-arranged hiding-place. The herd are thus forced down the steep, and, impelled to death by the pressure behind, some hundreds perish.

The Buffalo is another species of wild ox. The race is also widely diffused, being common in India, in Africa, and in some of the wilder or more southerly parts of Europe. It seems more tameable than the bison, and is used for domestic purposes in the East and in Africa. The native African buffalo affords hunting sport of the wildest kind. Having also a bull leader, he will rush headlong against any opposing enemy. Sometimes life is sacrificed in these exciting but terrible engagements.

The wild cattle of this country, though differing in conformation, have many habits in common with both these animals. They are kept in their native purity in the park of Lord Tankerville, at Chillingham, in Northumberland. A few are also kept in Scotland, in a park of the Duke of Hamilton's, at Chatelherault, in Lanarkshire; but the latter have a less certain pedigree. The former nobleman, in a communication to the Society of Arts, gives a very interesting account of their characteristics and habits, and allocates to them the palm of being the aboriginal cattle of the island. That the original breed, or at least some early breed of cattle, have been very large in size, is evident from the fossil bones found in bogs; yet, a smaller kind has been found in Cornwall, with a kind of horn more resembling the cattle of the Duke of Hamilton. Fitzstephen, who lived in the twelfth century, alludes to the wild bull of the woods as having its residence in the large forests near London. Guy, Earl of Warwick (whose contest with the Wild Dun Cow is commemorated by the animal's skull being still preserved in Warwick Castle) evidently had an encounter with a monstrous animal of the wild breed. Hollinshed also speaks of Bruce, in the fourteenth century, being nearly killed by a wild bull in the forest of Caledon; and from his attendant having rescued him, the well known name of "*Turnbull*" originated.

So recently as the sixteenth century, it seems these wild cattle were common in the Callender or Calder woods. Conrad Gesner describes them in the quaint legend-language of the day, as "white oxen maned about the neck like a lion. * * * This beast is so hateful and fearful of mankind, that it will not feed of that grasse or those hearbs whereof he savoureth a man hath touched, no not for many days together; and if by art or policy they happen to be taken alive, they will die with very sudden grief. If they meet a man, presently they make force at him, fearing neither dogs, spears, nor other weapons."

The Chillingham Park cattle—a specimen of which forms the frontispiece of this work—appear to retain all the characteristics of

wildness incidental to the untamed denizens of the forest. They hide their young, feed during the night, and conceal themselves as much as possible during the day in the woods, into which they steal if they appear to be observed. Their usual mode of retreat is to rise slowly, and set off at first in a walk—then a trot. They seldom begin to gallop till they have placed a hill or rising ground between themselves and the observer. "When they come down into the lower part of the park," continues his Lordship, "which they do at stated hours, they move like a regiment of cavalry in single file, the bulls leading the van, as in retreat it is the bulls that bring up the rear." Another peculiarity is, that when confronted closely they will at first dash off, remove a few hundred yards, and then all turn their faces and approach the object of their fear. On any further indications of approach, they rush off, but to a smaller distance, and return nearer the object; and so on every occasion until the cause of the disturbance departs. They do not seem, however, to have any disposition to pursue. Mr. Geo. Cully states a fact, related to him by Mr. Bailey, of Chillingham, which shows the native wildness of these cattle. He found a hidden calf two days old, very lean and feeble; but, on stroking its head, it nevertheless rose, pawed with its feet several times, bellowed out, and made a butt at that gentleman, which he evaded. It fell to the ground with the effort, but was so weak as to be unable to rise of itself. The whole herd became alarmed, and rushed to the rescue with great fury. Indeed so ferocious are the mothers, when they have calves, that they will gore or destroy any one who approaches them.

This strongly reminds us of a similar indication of wildness in the European bison, related by Gilberts. Four young bisons, caught in the forest of Bialoviezenski, refused to suckle a cow; but they were at length induced to suckle a goat, which was raised by being placed on a table. Yet, as soon as their hunger was satisfied, they would toss from them with their horns, to a distance of several feet, both the table and the goat.

It is a peculiarity in the wild cattle, that, when any one of their number seems to be irrecoverably ill, the rest immediately fall upon it, and gore it to death.

Now, whether all the great difference in conformation, colour, characteristics, &c. of cattle, be due to climate, breeding in and in, pasturage, crossing, &c., there is no doubt that, as far as man is concerned, the greatest victory he has won is in the domestication, or education as it may be called, of the lower animals. To convert a

wild and almost worthless animal into a tame, gentle, and willing slave, affording diminution of human labour, and yielding, besides, a supply of convenience, comfort, and luxury to man, is no ordinary conquest; but to cultivate one variety for the milk, butter, and cheese, and another for its beef, is a triumph of skill and judgment far surpassing in wonder the mere taming of an animal to domestic habits.

When we revert to the origin of the cattle of this country, and ask ourselves if it be possible that the long-horned Craven cow, and the polled Angus—the gentle, quiet, short-horn,—and the wild and ferocious breed of Chillingham, can be of the same origin, let it be remembered that the question is one of ample range. Is the rough-maned and bristly bison, with his large fore-quarters and his enormous head, of the same origin as the neat and sprightly Ayrshire cow? The subject is by far too extensive for discussion here; but there does not seem any reasonable doubt of the fact, that, within certain limits, circumstances alone will have a great tendency to change the conformations and characteristics of a species. Thus in cold countries whiteness prevails as a colour, and fur or wool as a coat. In warmer climates the brown prevails as a colour, and the hair as a covering; while in those absolutely hot, the dun seems to obtain as a colour, and the down as a clothing. So easy is the adaptation of organized beings to the state in which they are placed, and so vast is the expansibility of nature, that she can extend, or shorten, or increase, or diminish conformation, so as to render it suitable to the wants, the happiness, and the existence of the animal. Thus, though the *bones* of the bison and the Galloway may present but small distinction, yet the difference of skin, of mane, and of muscle, would make an ordinary observer startle at the idea of their having a common origin. The skull of a wolf and that of a wild dog of New Holland are all but identical; and it is possible that the influence of pasture may lengthen or shorten the horns—that by breeding from long or short-horned, or from hornless animals, the variety may be perpetuated, till they lose, in the course of ages, many of their original characteristics. It is impossible, for instance, in Essex, to grow the ox to the same size, other things being equal, as in the county of Durham; nor on the Ayrshire hills can he be produced in the same form or stature as in the Devonshire valleys. The Highland Scot is suited to the cold climate of the exposed and stormy north, and the short-horn to the sunny lowland pastures; and who shall say that the God of Nature has not impressed on these created beings the capability of

adapting themselves to his plastic handy-work, of developing their tendency to follow the peculiarities of the situation in which they are placed? An elephant can never degenerate into a mouse—a cat never improve into a tiger; but a Wild Dun Cow of Warwick may be the progenitor alike of the thin, spare, feeble-looking Alderney, and the flesh-mountain ox of Durham.

On this subject, Dr. Prichard says:—"In all our stocks of domesticated animals, we see profuse and infinite variety, and in the races of wild animals from which they originally descended, we find a uniform colour and figure for the most part to prevail. Domestication is to animals what cultivation is to vegetables, and the former probably differs from the natural state of the one class of beings, in the same circumstances which distinguish the latter from the natural condition of the other class. The most apparent of these is the abundant supply of the peculiar stimuli of each kind. Animals in a wild state procure a simple and unvaried food in precarious and deficient quantities, and are exposed to the inclemencies of the seasons. Their young are produced in similar circumstances to the state of seedlings, which spring uncultivated in a poor soil; but, in the improved state, all the stimuli of various food, of warmth, &c., are afforded in abundance; and the consequence is a luxuriant growth and *evolution of varieties*, and the exhibition of all the perfections of which each species is capable."

The Chillingham cattle may be the type of all our present breeds—the parent of all the endless varieties of our island.

The importance of the stock of cattle, as affecting the wealth and well-being of this country, is almost incalculable. Mr. M'Culloch estimates the entire number of cattle in the United Kingdom at 5,220,000; and if we add to this the number imported in 1847—in round numbers, 83,000—we shall have as many as 5,303,000 head of cattle in the United Kingdom in one year, which, at the small price of £8 each, will give an aggregate value of £42,424,000. This number is by no means an extreme one, but rather the reverse. Colquhoun estimated the cattle in England and Wales alone, in 1812, at 5,500,000; and M'Culloch founded his data from Arthur Young's estimate, made in 1779, to which he has only added one-third. As early maturity, and the extended quantity of food produced by convertible husbandry and improved farming, are also to be taken into account, it is probable that, at the present time, the cattle of the United Kingdom amount to nearer seven millions than five.

To afford some idea of the increasing cattle trade of London, it is

only necessary to mention, that in 1732 there were only 76,210 cattle sold in Smithfield; in 1830, a period of ninety-eight years, they had increased to 169,907 head; whereas, in 1846, a period of sixteen years more, they reached 210,757 head. If these had but an average weight of 650lbs., it would give a consumption of the meat slaughtered in London alone of not less than 136,992,050 lbs., without mentioning the quantities of meat sent up, as carcasses, by the different railways,—a trade which is now becoming a great source of profit in several parts of the country.

CHAPTER II.

THE MILK-PRODUCING BREEDS OF CATTLE.

It is usual with writers on cattle to classify them by the length or shortness of their horns; and, as a matter of natural history, it may be the most correct mode of dividing or classifying the different tribes of animals which prevail in the various districts of Great Britain and Ireland. But for practical purposes, it is by no means either advantageous or convenient. There are certain breeds which have peculiar qualities; and, as the size of horn has no connection whatever with those qualities; it is by far the most desirable course to classify them according to their properties rather than by any arbitrary mark of distinction which may be altogether unindicative of their peculiar characteristics.

There is in this country a great variety of pasturage—from the very rich to the very poor, and from the extremely warm to the exposed and stormy,—and in every gradation of this range a class of cattle is bred and propagated. The great object for which cattle are kept by the farmer is either to grow beef for the market, or to produce milk, to be sold, or converted into butter or cheese, for the supply of the great towns. Hence the one farmer selects the fat-producing, and the other the milk-producing, class of animals. Nature has provided that different races of animals, and different individuals of these races, are, more than others, adapted to the secretion of one or the other of these necessary products; nor has all the skill of man been able to detect a breed equally calculated, in any very great degree, for the production of both. The objects of the two secretions are essentially different; and the tendencies and qualities necessary for both are sparingly concentrated in the same animal. For while the former is

a reservoir of the carbonaceous matter of the food, reserved for subsequent use in the alimentary system, the latter is the secretion of a substance necessary to support the young progeny, until it is able to sustain itself, and procure from the green pastures the food provided by the Omniscient Giver of all. Hence, to produce milk is, more or less, the natural quality of all kinds of cattle. Some will give large quantities, but thin and poor in quality; some smaller quantities, and rich in oily matter; while others will afford a small portion, but abundant in solid matter. The first class would be selected by the milk-man, near the populous city; the second, by the dairy-man whose product was intended to be butter; and the third by the maker of cheese.

The milk-producing breeds are more widely diffused than any other, because they are capable of being kept to advantage on that description of herbage which is inadequate to sustain the fat-secreting breeds. The bulk of the grass-lands on the clay soils of the country, on the sides of the uplands, and even on the poorer sands, is quite adequate to supply the means of making butter or cheese; but it will very ill repay the person who attempts to feed cattle on herbage so inferior; while the rich alluvial feeding-pastures, which generally skirt the rivers of the kingdom, are far more profitably employed in raising summer beef, than in the production of milk, of cheese, or of butter. The length of horn, in a practical sense, has no connexion with the classifying of cattle. Some races of long-horns, of short-horns, of middle-horns, or even of polled animals, are to be placed amongst the one class we have alluded to, and some amongst the other. Hence we prefer arranging the breeds most celebrated for the quantity or quality of their milk under the first head, and reserve the second division for the races which possess a special aptitude for fattening.

The question here very naturally arises, how far it is possible to detect, by external conformation, the capabilities of the individual animal for the secretion of milk? There are instances in every breed, where it is evident that nature has been more bountiful, or more niggardly, in bestowing the qualities calculated to produce the secretion for which the race may be celebrated; and there are, doubtless, marks, well-known to the dairy-man, which seldom fail to indicate the status of the animal in the range of qualities peculiar to his race. On the continent of Europe this knowledge has been professed to be carried to a very minute extent. Francois Guénon, a Frenchman, professed to have found, by close observation, a mode of deciding authoritatively, not only the quantity and quality of milk which would be given by any particular cow, but also the period for which she

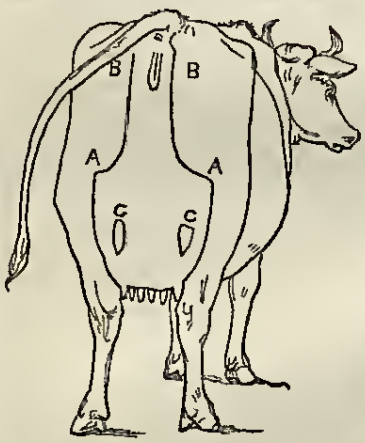
would retain her milk after calving. This he proposed to do by external appearances alone; and these of a somewhat arbitrary kind.

The Agricultural Society of Bourdeaux appointed a committee, in 1837, to test Guénon's capabilities, and they reported that, although the mode by which he ascertained these qualities was a secret, he had succeeded in satisfying them of the reality of the system he pursued. They subjected his process to an experimental test, which was very effectual. Separate cows were brought from strange dairies, and he wrote down the characteristics and qualities of each. These were compared with the separate statements given by the owners of the animals; and, in cases of more than sixty head, he succeeded in stating all their peculiarities exactly, excepting a very slight difference in appraising the quantity of milk—a difference the committee attributed solely to the quality of food given to the animal.

The Central Society of Agriculture of Cantal also reported upon his system with equal favour. They thus describe the process of investigation pursued:—"He accompanied the members of your committee to the farm of Veyrac, belonging the president of the society. He examined with scrupulous attention the fine dairy of cows of this domain, which is composed of one hundred milch cows of the best kind in the country. . . . M. Guénon gave upon each of them separately precise indications as to the quantity of milk each would give per diem, and the length of time they would hold their milk after being again in calf. We must avow to you, gentlemen, that they have almost in every instance agreed with the declarations of the owners of the cows."

It is not within the compass of this little work to give anything like a description of the mode he adopted, which has since been made known, though we believe not published in this country; but the foundation of his system is the classification of all kinds of cattle into eight classes or families: each family being divided into three sections, according to size only, and each section again subdivided into eight orders. The distinguishing marks by which he divides these are—1. the *Gravure*, commencing at the udder, and extending at the bearing; 2. the *Epis*, a soft brush of hair upon the animal; and 3. *Contrepoil*, or hair growing the contrary way. The peculiarities of these marks constitute the distinction between the families and orders. Thus, if the gravure be large, the reservoir of milk will be large, and the produce abundant. If it be formed of fine hair, if the skin be yellowish, and if a kind of bran powder comes off the skin of that colour, signs of a good milker are indicated. The rationale of it is, that this

gravure is but a continuation of, and corresponds with, the lactiferous vessels under the belly of the animal. These "epis," he states, correspond with the reservoir of milk, and are tufts of hair growing the wrong way on the right or left of the bearing. The largest epis indicates the most rapid loss of milk. The contrepoil, or hair growing the wrong way on the gravure, amidst that which grows upwards, shows a default in the production of milk, even if the gravure be large. We give a fac-simile of his Class I. "FLANDRINES."



A A. B B. The Gravure.
C C. The Epis.

So far the above is a general description of a system which he invests with minutiæ of no ordinary kind; and it is so precise and prolix that it would require some score of plates to show the variations of family, class, and order.

Without definitively pronouncing that there is no merit in Guénon's observations, it seems perfectly clear that many of his indications are of a character generally indicative of quality, but are carried far beyond their legitimate objects; for while a wide capacity of upper udder—a fine hair—a yellow scurf, are somewhat too indefinite to classify very precisely, they are just the points which may indicate a fineness of quality, and a large lactiferous capacity, that may add to the physiological signs by which a milking-cow is judged by the practical grazier.

Beauty of form is the last qualification in a good dairy cow. Symmetry to a breeder is no criterion of milking qualities, more than a very "pointy" short horn makes a good subject for a painter's cattle piece. Indeed the parallelogram is the beau-ideal of a fattened ox in section, and a cylinder is that of his superfices; thus exhibiting the essence of *roundness;* whereas the very converse is the perfection of the milker, that is *flatness.* The following are the best settled marks or characteristics of a milking cow. Head small and fine, eye bright and full, but with a quiet and placid expression, neck thin and deep, which gives it an appearance of hollowness; shoulder and breast narrow, bnt projecting; ribs flat; rumps broad, and tapering down to the knee joint, owing to the thighs being thin; tail small; udder large and round, with four teats, well formed, tapering to the end, and at a moderate distance from each other; thin in its skin, and with plenty of skin above; its fore-teats round and full, and with a large

subcutaneous or milk-vein, as it is commonly but erroneously called. There must, above all, be kindliness of touch, indicative at once of good breeding and of quiet disposition. These, with a calm and serene temper, are indications of milk-producing animals, which, where health is present, are almost infallible criterions.

We shall now proceed to describe some of the most prominent features of the best kinds of cattle for milk-producing; and a few only of the many varieties of cattle in the island will be selected. To review the peculiarities of each of the prevailing breeds in each county would fill a volume; we must therefore content ourselves with a selection of the best. We place first

THE AYRSHIRE BREED.

These are a valuable breed of middle-horned cattle, exceeding, perhaps, any breed of dairy cows in the kingdom. Small in size, their want of symmetry is not so obvious. They afford milk of a very rich quality, and rather oily. They fatten more rapidly than many other races of cattle; for when the butyraceous deposit is stopped by drying, the system soon accustoms itself to secrete fat, which they soon acquire on a pasture inferior to that required by more tender animals.

There is no description of the race equal to that described by Mr. Aiton, whose work on *Dairy Husbandry* so far exceeds any other, that it is generally quoted even to the present day:—"Head small, but rather long and narrow at the muzzle; the eye small, but smart and lively; the horns small, clear, crooked, and, at their roots, placed at a considerable distance from each other; neck long and slender, tapering towards the head, with no loose skin below; shoulders thin; forequarters light; hind-quarters large; back straight, broad behind; the joints rather loose and open; carcass deep, and pelvis capacious, and wide over the hips, with round fleshy buttocks; tail long and small; legs small and short, with firm joints; udder capacious, broad, and square, stretching forward, and neither fleshy, low hung, nor loose; the milk veins large and prominent; teats short, all pointing outwards, and at a considerable distance from each other; skin thin and soft; hair soft and woolly. The head, bones, horns, and all parts of least value small, and the general figure compact and well proportioned."

Such was Mr. Aiton's description; but, with the exception of thickness of buttock, it will be inappropriate to the present Ayrshire cow.

There are two other characteristics which seem so thoroughly belonging to this breed, that they ought not to be passed over. The one

is the black muzzle, and the other is the yellow red, which seems to be the natural colour of the race, arranged not in considerable quantities but in blots or patches. Thus the animals generally present a sort of checked aspect of golden-yellow, red and white.

The produce of these cows in milk and butter is very great. An Ayrshire cow will give from 600 to 800 gallons of milk in the course of the year; and five gallons per day is by no means uncommon for three months after calving. This, however, falls short of Colonel Fullarton's estimate, in his *Agriculture of Ayrshire*, when he states that, though the Ayrshire cow will not, when fat, weigh more than twenty to forty English stones, "it is not uncommon for these small cows to give from twenty-four to thirty-four English quarts of milk daily during the summer months, while some of them will give as much as forty quarts."

THE AYRSHIRE COW.

This milk is also very productive of butter. Three gallons and a half of such milk will yield a pound and a half of butter; so that as

much as 260 lbs. of butter will be yielded by an Ayrshire cow; and it is no uncommon thing to have eight or nine pounds of butter produced from one of these cows for some weeks after calving. About twenty-six gallons of milk will afford fourteen pounds of cheese; or a good cow will yield some thirty-five stone of cheese per annum, which, taken at 10s. per stone, will produce in this article alone as much as £18 per annum.

Is has been questioned whether the rich districts of Ayrshire ought to be occupied with this breed of cattle. They are said to be more suitable for cottiers than for graziers, and that the latter ought to direct their attention to feeding the short-horn, while the former should combine dairy-farming only with the occupation of a labourer. To this it may be answered, that while the cold rains, so prevalent in that county, would render it problematical whether the short-horns would be sufficiently hardy, it is also certain that the second-rate pasturage of much of the grass land is more suitable for the dairy cow, possessing the hardiness of the Ayrshire breed, than calculated for fattening the less enduring short-horn. Nor have the improvements in the breed of Ayrshire cattle increased their milking qualities. To breed what would sell in England, and what would feed as steers, has been too much an object; and as the larger breed of Ayrshire cattle are more profitable for the market, and the smaller for the dairy, the former have been more encouraged.—The preceding engraving represents a much improved Ayrshire cow, of rather a large size.

There is another peculiarity of the Ayrshire cows which is deserving of notice. They hold to their milk to a very late period. They are cultivated and nurtured to give milk. Nature would teach an animal to give a supply so long as its calf needed that nutritious assistance; but so far have the milking qualities of the Ayrshire cow been brought out, that in some instances it has been known to yield milk all the year round, and even retain it to an advanced age.

THE ALDERNEY BREED.

General consent has given the name of "Alderney" to the Channel Island breed of cattle, which have been so long celebrated for the *quantity* of milk they give in proportion to their size; but, above all, for the extraordinary richness of its *quality*. There is every probability, however, that these cattle were originally a Norman breed, imported and improved in Jersey, and then sent to Alderney; and thus a common stock, famous far beyond the milk-cows of Normandy, has been produced, which is considered so valuable in this country

as to produce prices varying from £20 to £30. There is a firm of gentlemen in Yorkshire whose business it is to purchase these extraordinary cattle. They make regular journeys to the Island to select them, and have periodical sales by auction. In the neighbourhood of London, also, several parties import them for sale by auction and at their private establishments; but the best breeds are not easily procured.

We are indebted to Colonel le Couteur for almost all we know of this breed of cattle. In many respects it resembles the Ayrshire cow. Indeed so close is the resemblance, that Mr. Quayle (in his *Agricultural Survey of Jersey*, communicated to the Board of Agriculture,) states that "the Ayrshire was a cross between the short-horned breed and the Alderney."

As the qualities of the Alderney breed of cattle are exclusively milk-producing, we expect to find anything but beauty of form. Indeed, until within the last twenty years, a more misshapen animal it is difficult to conceive. The Channel Islanders, possessing cattle superior to others for the richness of their milk, and well sustained by the inferior herbage the island produced, were satisfied with their ungainly form. The breed might be thus described:—Large cheeks, thin hollow neck, hollow back, thin hams, flat sides, long between hip and ribs, crooked legs, high shoulders, drooping rump, and tapering chest.

The specimens of improved forms of cattle, which began to receive the attention of agricultural societies, tended to call attention to the improvement of the Alderney breed. Hence a society sprang up, under the presidency of General Thornton, who, by selecting the best specimens, drew up a scale consisting of nine articles, and to each of these articles attached a number of points—thirty of which were assumed to be perfection in a cow. These are much more definite, and we think more practical, than those of M. Guénon; and we cannot resist giving them, because they indicate the proper criterion of the improved Alderney cow. They are for cows and heifers:—

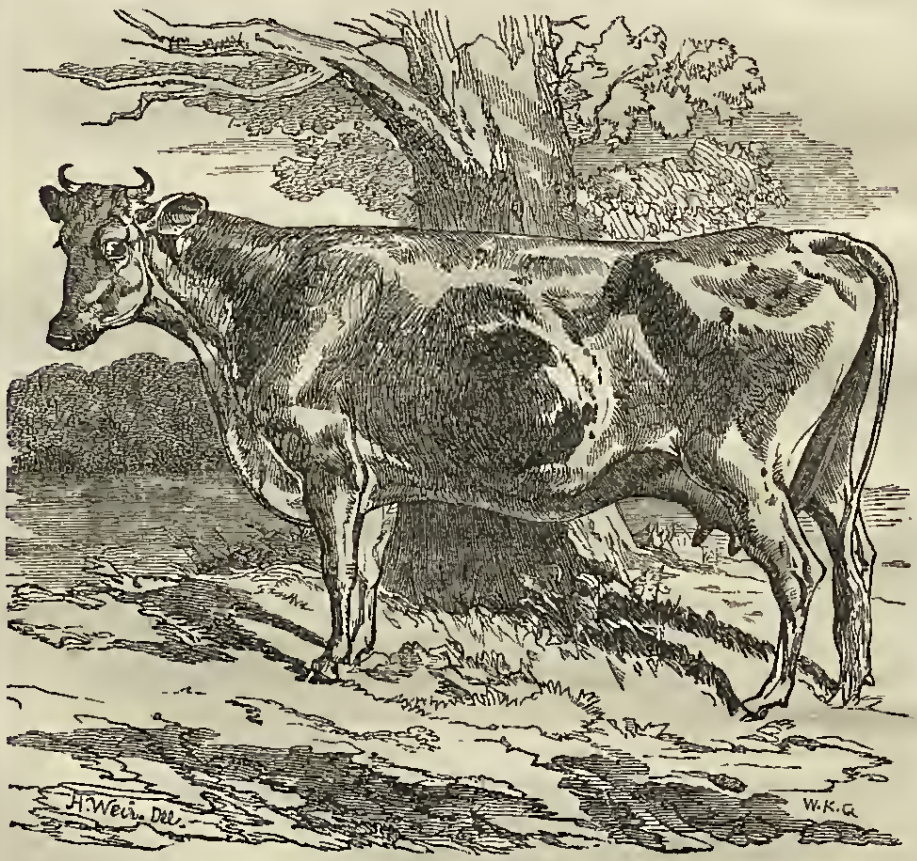
	Points.
I. Breed, on both parent's sides, reputed for producing rich and *yellow* butter, ...	4
II. Head small, fine, and tapering; eye full and lively; *muzzle fine, and encircled with white;* horns polished, a little crumpled, tipped with black; ears small, of an orange-colour within, ...	8
Carry over, ...	12

	Brought over,	12
III.	Back straight, from the withers to the setting on of the tail; chest deep, and nearly of a line with the belly,	4
IV.	Hide thin, movable, but not too loose, well covered with fine soft hair, of good colour,	2
V.	Barrel hooped and deep, well-ribbed home (having but little space between the ribs and hips; tail fine, hanging two inches below the hock,	4
VI.	Fore-legs straight and fine; thighs full and long, close together when viewed from behind; hind legs short, and bones rather fine; hoop small; hind legs not to cross in walking,	2
VII.	Udder full, well up behind; teats large, and squarely placed, being wide apart; milk veins large and swelling,	4
VIII.	Growth,	1
IX.	General appearance,	2
	Perfection for cows and heifers,	31

We cannot resist giving an engraving of the perfect Alderney, because it may be taken as a fair specimen not only of the most perfect animal which the above scale aims at indicating, but will also mark the great improvement in the style of this breed of cattle; and will, so far, incidentally mark the improved character of the *other* breeds of cattle in the country. Moreover, we would ask, is it more wonderful that the wild cattle of Chillingham Park, changed and improved by the agency of food, climate, crossing, in and in breeding, and the skill of man, should be the type of the original breed of cattle in this country, than it is to see his handiwork, as displayed in the improved form of the Alderney cattle during a period of twenty years?

The produce of these small animals, both in milk and butter, is very great, and may be taken, in fair specimens, at twenty quarts of milk daily, and ten pounds of butter in the week, during the months of April, May, June, July, and August. Instances are recorded of cows giving twenty-six quarts of milk in the twenty-four hours, and yielding as much as fourteen pounds of butter per week! From this it is clear that the cream is of very rich quality; the milk itself being superior to much of the town-made cream, and the cream almost resembling cream-cheese. It is considered too rich by many

persons for making cheese; but instances are recorded of successful cheese-making from this milk. M. Le Feuvre, of La Hogue, succeeded in making cheese of a very superior quality from this fine milk—equal indeed to double Gloucester. Fourteen quarts of milk being capable of producing a pound of butter, the same quantity would give a pound and a half of cheese; and the whey or drainings of twenty pounds of this cheese would produce four pounds of butter, somewhat inferior, for toast, but quite adequate for the making of pastry. Compared



THE ALDERNEY BREED.

with the milk of any other cows celebrated for dairy purposes, that of the Alderney is very superior. An experiment was made, in the months of May, June, July, and August, between eight Alderney and eight Kerry cows. In the first month, the Alderneys gave 25 per cent. of cream against 10 per cent. of the Kerrys; in June, 20 per cent. against 10; in July, 23 per cent. against 10; and in August, 16 per cent. against 13; giving an average of about one hundred per cent. more cream than the Kerrys,—a race of cows rather celebrated for

dairy qualities. But this was not all. Three pints of cream from the Alderneys produced 1 lb. 8½ oz. of butter; from the Kerrys, 1 lb. 4½ oz. This, too, was taken in the month of August, when it will be seen the milk of the Alderneys was falling off. The experiment was made by Mr. White, on the farm of the Hon. R. Clive of Oakley Park, and deserves every credit, as it seems to have been carefully made.

THE YORKSHIRE COW.

Having given instances of milk-producing cows from the middle-horn and crumpled-horn breeds, we now select one of the short-horned class; not indeed, the improved Durham short-horn, but a large capacious animal possessing several of its qualities, and giving a large quantity of milk, with as much aptitude to fatten as is consistent with the production of milk. Hence it is selected by the dairymen of large towns, and especially of London, for the supply of milk for a given period. When fatted on distillers' refuse, and other waste matters, which a town supplies, it thus affords double remuneration to the dairyman.

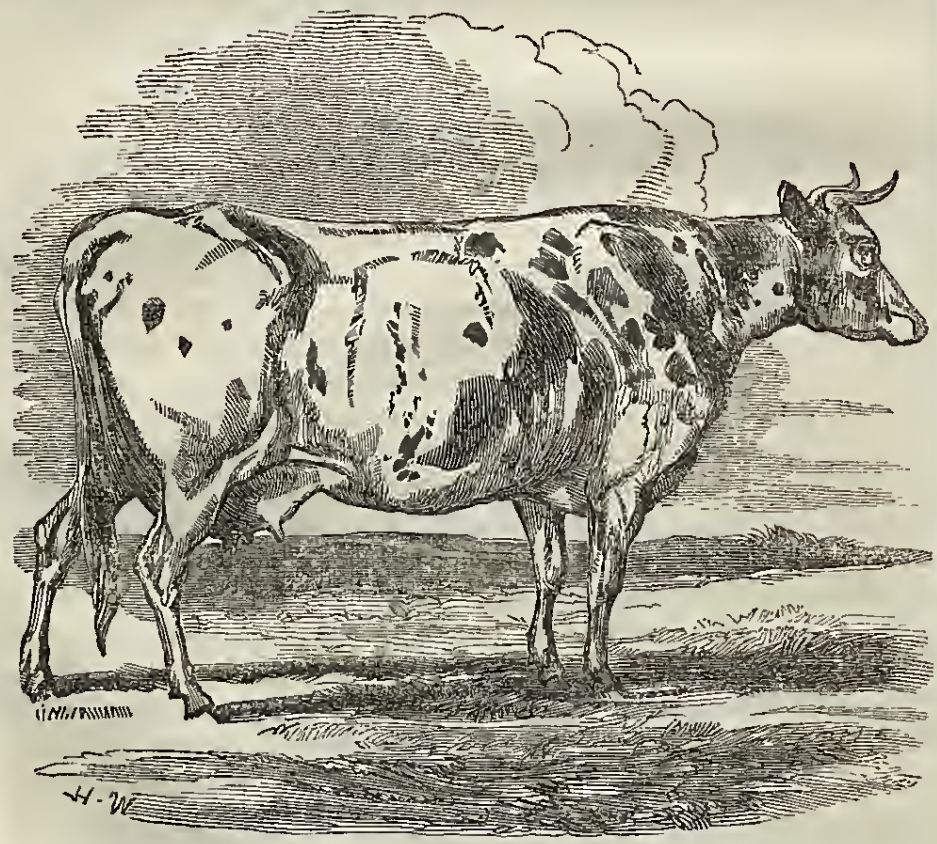
The Yorkshire cow is of much larger size than either of those we have been considering, and, when fat, will weigh from sixty to eighty stone. Her head is fine, and somewhat small; there is a serene placidity of eye, which shows a mild and gentle disposition, tending alike to produce fat and milk. The horns are small and white, the muzzle without black spots; the breast deep and prominent, but that and the shoulders thin; the neck somewhat narrow, but full below the shoulders, and without any loose skin; the barrel somewhat round; the belly capacious; milk-vein large; back perfectly straight; rump wide, and flat as a table; tail small, and set on so that there is almost a straight line from the tail to the head. The prevailing colour is roan, or red and white; and sometimes white, with the tips of the ears red. The thighs are thin; but the legs are straight and rather short. The udder is very large and muscular, projecting forwards, well filled up behind, and so broad as to give the cow the appearance of a waddle in her walking. Indeed her qualities are not inappropriately described in some doggerel lines often quoted; and two of the verses we shall venture to give, as most aptly descriptive of the Yorkshire cow:—

> "She's broad in her ribs, and long in her rump,
> A straight and flat back without ever a hump;
> She's wide in her hips, and calm in her eyes,
> She's fine in her shoulders, and thin in her thighs.

"She's light in her neck, and small in her tail,
She's wide in her breast, and good at the pail;
She's fine in her bone, and silky of skin;
She's a grazier's without, and a butcher's within."

The engraving given below represents a Yorkshire cow, and is a fair specimen of a short-horn Yorkshire cow, without pretensions to pedigree,—a sample of the kind purchased by the dairymen of London.

The quantity of milk given by these cows by far exceeds that of any others, though less perhaps than that of some others *in proportion to size.* The writer has had instances where as much as thirty quarts per day, in summer, have been given. The distended udder has so



THE YORKSHIRE COW.

swollen before calving—"wedged," is the local and technical term—that she was obliged to be milked several days before she calved; and, after calving, had to be milked three times a-day, for fear of the consequences of an over-distended udder. Moreover, she gave a

large quantity of butter as well as milk; and soon after calving she has given fifteen pounds per week.

When the Yorkshire cow is purchased for the London dairies, usually after her third calf, her milk changes its character. She is rich in her native pastures in butyraceous matter; but the object in London, Liverpool, and the large towns, is rather to increase the *quantity*, than to improve the *quality* of the milk; hence the cattle are fed with brewers' grains, boiled linseed, &c. &c., and the out-door exercise is restricted, so that their powers of secretion all converge to the production of milk alone. Mr. Laycock, in his London dairy, which is supplied by Yorkshire cows, retains no cow which does not yield two gallons of milk per day, and the average of his dairy is as much as nine quarts daily.

Considering all these things, and taking into account the carcass value of the cow after she has yielded her copious supplies of milk, it is not too much to affirm, that there is no breed of the vaccine race so profitable as the Yorkshire cow.

Having thus minutely considered the three leading breeds of dairy cattle,—the cheese-producing Ayrshire, the butter-secreting Alderney, and the milk-giving Yorkshire,—it only remains to glance at the breeds or crosses which prevail in the principal dairy districts of the country; for as types of this class of cattle, the three breeds above-named may be taken as perfect.

THE GLOUCESTERSHIRE BREED.

This is more a mixture of the several breeds of the country (long-horn and middle-horn) than any distinctive race,—the old Gloucester cow being nearly extinct. The various crosses to which dairy cattle have been subjected has obliterated all traces of the original race; but early crosses with the long-horned breed have somewhat prevailed. The Devons have also been used as a cross to impart a more kindly disposition to fatten, and the Durham short-horns have also occasionally been tried; but the poverty of keep, too common amongst the Gloucestershire dairymen, has had a great tendency to deteriorate the breed. The same fate has in general attended attempts to cross with the Herefordshire cattle.

Of the successful crosses adopted in this country, one by Mr. Drinkwater S. Hayward may be mentioned. He first crosses an ordinary Gloucester bull with an Alderney cow; and having thus obtained richness in the milk, he adopts a Durham bull to increase the tendency to flesh and to size, and to improve the form generally.

This gives a stock one half Durham; while the other half is constituted of one part Gloucester and one half Alderney. He keeps one hundred cows, and selects, for keeping, the calves produced by his best milkers. The average yield of an ordinary Gloucester cow may be reckoned at five hundred gallons of milk, yielding about twenty-four stone of single Gloucester cheese; the remainder of the milk being used in the family, and for fatting the calves, or for pig feeding, which is largely practised in all dairy districts.

THE LEICESTERSHIRE BREED.

The old breed of this county has had a more successful struggle for existence than the native breed of Gloucestershire. It was here that Bakewell exerted his talents to improve the long-horned breed of cattle. Though he succeeded in removing the coarseness from these animals, and increased their tendency to fatten, it appears he did not attain the object of either establishing or improving their dairy qualities. Hence his breed is but little prized, and scarcely patronized by the Leicestershire dairymen, who prefer the coarser and larger animals, that give large quantities of good milk, to those which have less milk-giving capabilities, but are more suitable for the grazier.

The yield of cheese, rather than that of milk, is the object of the dairymen of Leicestershire. A good cow will give about four hundred pounds of cheese, and produce as many gallons of milk, in the year, allowing for the seven weeks when she is supposed to be dry.

In some districts the cows are kept for six, or seven, and even more years, especially when they are good cheese producers; for it is of more consequence to the farmer to have a cow which, for six years, gives him an annual supply of the stock in trade of his farm—his cheese—than to get a few pounds more or less when she is sold. Indeed a smaller difference really takes place than may be at first imagined. The rich Leicestershire grass enables the farmer, on a large scale at least, to sell off his cattle fat, which would have been disposed of for the dairy. Hence, as old cows of any kind are not expected to be very valuable graziers, he does not expect her to do wonders; and if he succeeds in getting her moderately fat, he is satisfied with taking a smaller price per stone for her beef than is received for a primer animal. She would only make "cow beef"—merely fitted for ship beef, or for "provisioning the navy."

THE KERRY BREED.

Crossing the Irish Channel there is a hardy small-sized cow celebrated as a cottier's dairy cow—the neat pet-like cow of Kerry. Her placid

countenance, patient, meek deportment, fine head and legs, her small tail, flat shoulders, breast, and quarters, and her skinny udder and large milk-vein, all bespeak the characteristics of the milker. Hence she is a treasure to the cottage farmer! She is so hardy that she will live where other cattle will starve. She will yield milk at the expense of her own muscles—nay, will yield it abundantly when they appear all sunken; and will give it also of quality so rich, that she is a perfect machine for converting the hardest and coarsest cattle-food into rich and nutritious milk and butter.

THE CHESHIRE BREED.

Like that of Gloucestershire, this breed is becoming rapidly extinct. The old breed of the county was, like that of most dairy districts, a long-horned variety; but the vicinity of the large town dairy system, introduced into the country by the growth of large towns, has brought here, as elsewhere, the short-horn cow of Yorkshire into competition with the native breed. The extra *quantity* of milk they produce has been more regarded than its *quality;* consequently the character of the Cheshire cheese has been deteriorated in the markets.

Another reason why the short-horned cattle have made more way in this county than in others, is the care taken to prevent exposure to the weather, and also to the manuring the worn-out grass land with bone-dust. This animal manure so improves it as to give great advantage to an animal requiring a good quality as well as a fair quantity of food, both of which the short-horn requires.

Mr. Palin, in his Prize Essay on the Farming of Cheshire, appropriately observes:—"Doubts, I believe, exist in the minds of some intelligent farmers, whether any improvement has been effected in the milking properties of dairy cows, as regards quality, by the introduction of the improved short-horns amongst them. That the latter breed is much disposed to fatten is admitted, but this class of cattle does not stand very high in public estimation as milkers. It may, therefore, be reasonably supposed that there are good grounds for thinking that it is very possible to introduce too much of the improved short-horned blood into the dairy stocks, and that great caution should be taken in crossing. However that may be, I am of opinion that an improvement may be effected by the introduction of the blood *to a certain extent;* care being always taken to select male animals intended to be reared from the best milkers."

THE DORSETSHIRE BREED.

In this, as in most dairy districts, milk is more an object than either

form or fat, and hence a somewhat coarse ill-shapen class of cattle prevails. They are of the long-horn breed, large, and coarse, principally of a red colour, with flat chests and buttocks. Attempts have been made to cross this also with the Devon, Hereford, and Ayrshire breeds; but without success. The only advance the dairymen have been enabled to make in this country has been to introduce one Alderney to a dairy for every ten or twelve of the native breed; this is found to have a very beneficial tendency in increasing the quantity of cream, and improving the quality of the butter.

It is not necessary to expatiate on all the crosses or breeds, more or less distinct, which prevail in the dairy districts of this country, nor does it come within the range of this treatise to examine the qualities of the foreign breeds. We shall, however, conclude with a short description of one more animal, which may be classed, after all, as a sort of milking cow. We mean the

SCOTTISH KYLOE BREED.

The cattle of this breed are so called from the fact of their having crossed the *Kyles*, or ferries, with which the Highlands of Scotland abound. These were, as Parkinson observes, the models which Bakewell had in view for the improvement of the Leicestershire breed, and had he known more of them in the early stages, they might have had their share in the crossings for improving the Dishley herd. They may be considered the perfection of the largest middle-horned race of cattle—having their long *rumps, loins, and crops*, with but a moderate amount of offal. As length in these parts is thoroughly consistent with thinness of chest, buttocks, and neck, it is not improbable that improvements in this direction would enable the dairyman to have a rich milk-secreting animal, with a considerable aptitude to fatten and form flesh on the most valuable parts, when she came into the hands of the grazier.

The hardihood of the Kyloe cow makes up for the wildness of her nature. She can resist a cold blast under which a delicate lowland dairy-cow would perish. She will consume the small and stunted grasses which appear among the heath, the mosses, and even sometimes the sea-weed itself. In winter, when the severity of the weather prevents the cattle from obtaining their food from the morass and the moor, they are occasionally assisted by a few oatmeal balls. Thus it need not excite surprise if the aggregate amount of butter and cheese raised by these miserable supplies is but small. Thirty-two pounds of butter per annum may be stated as the produce of a

cow in the Hebrides, and from ninety to one hundred pounds of cheese, which is made after their celebrated fashion, by flavouring it with aromatic herbs added to the rennet.

It is difficult to see that the qualities of dairy cattle are specific and distinct, and that any attempt to transmute them, so as to exchange the *flatness* of conformation of the milker for the *rotundity* of the grazing animal, is done at the expense of her dairying qualifications. Nor is it difficult to see that those breeds possessing the conformations calculated for milk secretion, are precisely those which, from their endurance and hardness, are most suitable for second-rate grass land, where the dairying processes are principally carried on. When the soil will not feed the fat-producing animal, Providence has wisely provided the milker, in order that no spot of ground should be without the produce fitted for his creature man.

CHAPTER III.

FAT-PRODUCING BREEDS OF CATTLE.

WHATEVER theoretical objections may be raised against over-fed cattle, and great as may be the attempts to disparage the "mountains of fat," as highly-fed cattle are sometimes designated, there is no doubt of the practical fact, that the best butcher cannot sell anything but the best fatted beef. Of whatever age, size, or shape, a half-fatted ox may be, he is never selected by judges as fit for human food. Hence a well-fatted animal always commands a better price per pound than one imperfectly fed, and the parts selected as the primest beef are precisely those where there is the largest deposits of fat. The rump, the crop, and the sirloin (the very favourite cuts, which always command from twenty to twenty-five per cent. more than any other part of the ox), are just those parts on which the largest quantities of fat are found. Thus, instead of the taste and fashion of the age being against the excessive fattening of animals, it is, practically, exactly the reverse. Where there is the most fat there is the best lean; where there is the greatest amount of muscle, without its share of fat, that part is accounted inferior, and used for a different purpose. In fact, so far from fat being a disease, it is a condition of muscle necessary to its utility as food—a source of luxury to the rich, and of comfort to the poor.

Fattening is a secretive power possessed by grazing animals, which enables them to reserve a store of the superfluous food they take for seasons of cold or of scarcity. The fat collects round the angular bones of the animal, and gives the appearance of rotundity. Hence the tendency to secrete fat is indicated by a *roundness* of form, as opposed to the *flatness* of a milk-secreting animal. The fat lubricates the joints, gives elasticity to the skin and muscles, and obviates the effects of pressure. But, above all, it is a store of heat-producing aliment, laid up for seasons of scarcity and want.

The food of animals, for the most part, may be said to consist of a saccharine, an oleaginous, and an albuminous principle. To the first belong all the starchy, saccharine, and gummy parts of the plants, which undergo changes in the digestive organs similar to fermentation before they can be assimilated in the system; through them also is animal heat sustained. In sluggish animals the oily parts of plants are deposited and laid up as fat; and, when vigour and strength fail it is taken up, and supplies the place of the consumed saccharine matter. The albuminous or gelatinous principle of plants is mainly useful in forcing muscle; while the ashes of plants, the unconsumable parts, are chiefly for the supply of bone, hair, and horn, as well as of muscle and blood. They also supply the waste which is continually going on. Now these are the several qualities which are essentially characteristic of a disposition to fatten.

There have not hitherto been any book-rules laid down, as in the case of Mr. Guénon's indications of milking cows; * but the above are marks so definite and well understood, that they are comprehended and acted upon by every grazier, though, perhaps, not easy to describe. A land valuer will tell with reasonable accuracy the productive quality of a given soil to which he may have been a stranger; but it would be difficult for him to describe upon paper all the indications of barrenness or fertility, which his practised eye alone could detect. It is by experience and skilful acumen that the grazier acquires his knowledge, and not by theoretical rules. Observation, judgment, powerful perceptive faculties, and minute discrimination, are essential to his success.

The first indications he relies on is the *touch*. It is the absolute criterion of *quality*, which is supposed to be the keystone of perfection

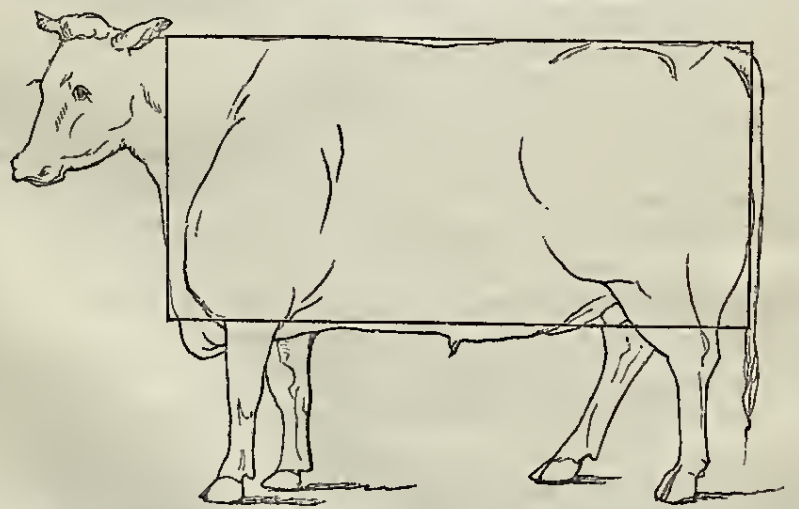
* See p. 18. It is a remarkable fact that M. Guénon (when on a recent visit to Mr. Hudson, of Castleacre, one of our best English farmers) selected those out of his Devon cattle which proved to be the best milkers.

in all vaccine *animals*, whether for the pail or the butcher. The skin is so intimately connected with the internal organs, that it is questionable whether even the schools of medicine in the diagnosis of disease might not avail themselves of the knowledge of this important point. The physiological tendencies of cattle are of the last and most vital importance. The skin must neither be thick, nor hard, nor adhere firmly to the muscles. If it is so, the animal is a hard grazer, a difficult and obstinate feeder. No skilful man will purchase her. She must go to a novice, and even to him at a price so low as to tempt him to be a purchaser. On the other hand, the skin must not be thin, like paper, nor flaccid, loose in the hand, nor flabby. This is the opposite extreme, which is indicative of delicateness, and possibly of inaptitude to retain the fat. It must be *elastic* and velvety, soft and pliable, presenting to the touch a gentle resistance, but so delicate as to give pleasure to the sensitive hand,—a skin, in short, which seems at first to give an indentation from the pressure of the fingers, but which again rises to its place by a gentle elasticity. The hair is of nearly as much importance as the skin. A hard skin will have straight and "stickle" hair; it will not have a curl, but be thinly and lankly distributed equally over the surface. A proper grazing animal will have a *mossy* coat, not absolutely curled, but having a disposition to a graceful turn, or a semifold, which presents a waving inequality; yet as different from a close and straightly laid coat, as it is from one standing off the animal at right angles—which is a strong symptom of disease. It will also, in a thriving animal, be licked here and there with its tongue.

So much for the feeding qualities of the animal, and the conformations indicative of this kindly disposition. The next consideration is the formation of the animal, so far as it is favourable to the growth of fat. There must be size where large weights are required. Christmas beef, for instance, is expected to be *large* as well as *fat*. The symbol of festivity should be capacious as well as prime in quality. But it is so much a matter of choice and circumstances with the grazer that profit alone will be his guide. The axiom, however, as a general rule, will be, that the better the grazing soil the larger the animal, and the poorer the soil the smaller the animal. Small animals are unquestionably much more easily fed; and they are well known by experienced men to be those best adapted to the second-rate feeding pastures of this country. Beyond this there must be *breadth* of carcass. This is indicative of fattening, perhaps, above all other qualifications. If rumps are favourite joints, and produce the best

price, it is best to have the animal which will grow the longest, the broadest, and the best rump; the same may be said of crop, and of sirloin; but *breadth* is essential to the consumption of that quantity of food which is necessary to the development of a large amount of fat. Thus a deep wide chest, favourable for the respiratory aud circulating functions, enables the animal to consume a large amount of food, to burn up the sugary and deposit the fatty matter,—as then useless, but afterwards to be prized. A full round crop will be of the same physiological utility, while a broad and open framework at the hips will afford scope for the action of the liver and kidneys.

There are other points also of much importance: the head must be small and fine. Not, perhaps, that it is of any special use in the fattening of the animal to be so constructed, but it is indicative of the bones being small and the legs short. For constitutional powers, the beast should have his ribs extended well towards the thigh-bones or hips, so as to leave as little unprotected space as possible. There must be no angular or abrupt points; all must be round, and broad, and parallel. Any depression in the lean animal will show a deficient deposit of flesh and fat, when sold to the butcher, and thus deteriorate its value; and hence the animal must be round and full. But either fancy, or accident, or skill,—we will not pretend to say which—has associated *symmetry* with quality and conformation, as a point of



great importance in animals calculated for fattening; and there is no doubt that, to a certain extent, this is so. The beast must be a system of mathematical lines. To the advocate of symmetry the setting on of a tail will be a condemning fault. The ridge of the back like a

straight line, with the outline of the belly exactly parallel, when viewed from the side, and a depth and squareness when viewed from behind, like a geometrical, cube may be said to be the indications of excellence in a fat ox. We give an outline of the points of excellence in one of these animals. Now, these qualities are inherent in some breeds. There may be cases and instances in all the improved breeds, and in most there may be failures. By far the first in the list for feeding excellence are—

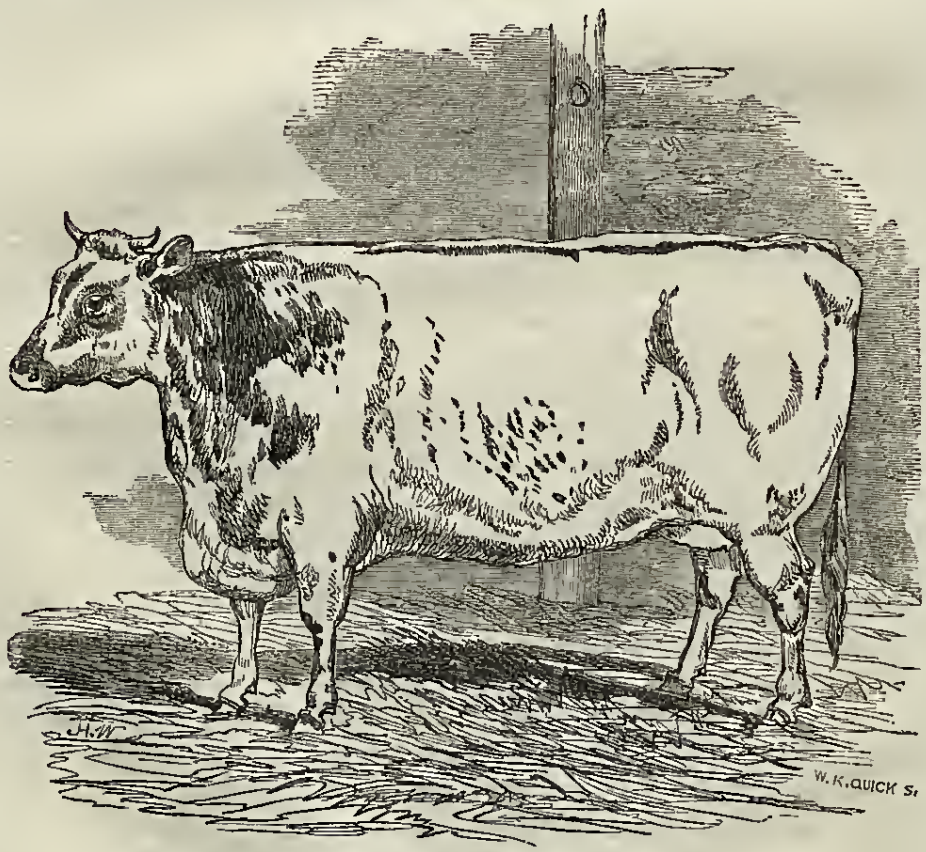
THE SHORT-HORN, OR DURHAM BREED.

In speaking of this breed we mean that which owes its almost European notoriety to the vast improvements effected by Charles Colling. The origin of the breed, as well as the elements from which he worked out his magical effects, is involved in great obscurity. These animals are supposed by some to be traced to Holderness,—and, according to others, to have been imported from Holstein. From continental Europe they certainly appear to have sprung; and, being successively improved by a variety of breeders, they have ended in that distinct race of animals, extraordinary beyond all others for their astonishing propensities to feed. Others, again, refer their origin to a native race of cattle called the Teeswater, because they have from time immemorial inhabited the valley which the Tees has formed by its washings down of the mountain limestone rocks in which it has its origin. These, it is said, being crossed by the Holderness importations, gradually became a new race.

The late Mr. Bates traces the short-horns to a breed in the possession of the Aslabies of Studley, and the Rev. H. Berry to an improvement in the East Riding of Yorkshire, by the importation of a breed from Holland by Sir W. St. Quintin of Scampston. Of these obscure ages of the short-horns, however, it is hardly necessary to say more than this,—that a breed from time immemorial inhabited the valley of the Tees, which, trained and educated to feed, for a vast succession of generations, on its fertile deposits, acquired the habit of speedy fat-forming. In these valleys, where *hay alone* will feed the largest ox, the production of fat would be so far an object, that breeders would always select the best and easiest feeding animals; and thus the character of the district, through a number of centuries, might easily lay the groundwork of that improvement which the Milbanks, the Greys, the Booths, the Coates, and above all the Collings, have effected.

We will give the latest description of the qualities of the modern short-horn from the most recent authority, Mr. Dickson. After

referring to the general symmetry of the frame and its delicate colour, either deep-red, cream-coloured, white, or delicate roan—the latter, by the by, the most fashionable and indeed prevailing colour—he speaks of it as possessing "the mellowest touch, supported on small clean limbs, showing, like those of the greyhound and the race horse, the union of strength with fineness, and ornamented with a small, lengthy, tapering head, neatly set on a broad, firm, deep neek, furnished with a small muzzle, wide nostrils, prominent mildly-beaming eyes; thin, large, veiny ears, set near the crown of the head, and protected in front with semicircularly-bent white or brownish coloured short, smooth, pointed horns;—all these several parts combine to form a symmetrical harmony which has never been surpassed in beauty and sweetness by any other species of the domesticated ox."



MR. WILSON'S SHORT-HORNED HEIFER.

Bearing in mind what has been stated to be the perfection of a fat animal, the same authority, speaking of the short-horn, says—"We

have a stright level back from behind the horns to the top of the tail, full buttocks, and a projecting brisket; we have, in short, *the rectangular form;* we have also the level line across the hook-bones (hip), and the level top of the shoulder across the ox, and perpendicular lines down the hind and fore legs on both sides; these constituting *the square form* when the ox is viewed before and behind, and we have straight parallel lines from the sides of the shoulders along the outmost parts of the ribs and the sides of the hind quarters; and we have these lines connected at their ends by others of shorter and equal length across the end of the rump and the top of the shoulder; thus constituting the rectangular form of the ox when viewed from above down the back."

It will be far from our purpose to show either the immense amount of fat which has at one time or another accumulated on the backs of these wonderful animals, or the speed with which this has been done. Neither would it tend much to elucidate the principles of breeding or grazing, by describing at length the prices which short-horns have commanded, and still continue to command.

The Durham Ox, a son of Charles Colling's Favourite, weighed 187 stone 2 lbs. The Yorkshire Ox, bred by Mr. Dunhill, of Newton, near Doncaster, weighed, when killed, 264 stones 13 lbs. These are weights of 14 lbs. to the stone, and show the strange capabilities to accumulate fat and flesh possessed by this extraordinary race of animals. Though there is not, perhaps, another instance on record of any bull selling for as much money as Charles Colling's Comet, which sold for 1000 guineas, and whose herd, forty-seven in number, sold for £7115; yet £500, £600, and as much as £800, are still given for a first-rate short-horn bull.

In improving his breed, Mr. Colling had recourse to a single cross with the polled Galloway. He then bred back to the short-horn, and the result was a stock called the Alloy, so named at first in contempt, but afterwards as a distinction. His cross was between a short-horned bull called Bollingbroke, and a beautiful red Galloway cow, which produced a bull calf. This in due time was the sire of a bull calf, by the pure short-horn cow, Johanna. The bull calf again became the sire of the cow, Lady, by a pure short-horn cow, which became the dam of the noted bull, Favourite. Thus was founded this celebrated stock. At the sale, the cow, Lady, fourteen years old, was sold for 206 guineas, and her daughter, Countess, nine years old, for 400 guineas.

Nor is it in their rapid fattening alone that this race of cattle

excels. They are beyond all question the most remarkable for early maturity. Fat deposits are generally the result of a mature state of the animal. There are few animals which develop them to any degree, until they are fully formed. The short-horn is an exception. They commence the fat-forming process as calves. This seems to increase with their growth, and at a year old they have all the semblance of cows. This is strikingly manifested by the drawing of the heifor belonging to Mr. Wilson, of Brawirth, taken at only twelve months old. (See page 36.)

The feeders of short-horns, instead of keeping them to three, four, or five years of age, fatten and sell them off at from two to two and a half years. They can thus turn off one half more, at least, of beef, from their farms or their stalls, than could possibly be produced with

THE SHORT-HORNED COW.

any other breed. Thus they have quick returns and large amounts of beef for the food-consumer. We will not deny that the short-horned

requires good keep, and shelter, and care. She needs nursing and nourishing diet when young; but she repays all; for she is a cow when another is a calf. The ox is fat when the other is growing. She will purchase a horse before a Devon will buy a saddle. Hence the short-horn stands the very first on the list of fat-producing breeds of cattle. We give, on the preceding page, a specimen of a matured short-horn cow.

THE HEREFORD BREED.

This is a middle-born breed of cattle, to which a good deal of pains has lately been devoted. The success of short-horn breeders—of the Booths, the Bates, the Wileys, the Hoppers, and a score more of short-horned patrons,—have caused a healthy emulation. The difference between the Hereford cattle now exhibited and those shown some ten or twelve years ago, shows not only that these breeders have judgment and skill, but that the breed has fattening capabilities.

The old Hereford was a deep brown animal, sometimes with an ochery cast, free from white, like the Devons; but an improved breed now possesses the county, in which the invariable fashion is a dark red, with a white face, white belly, and not unfrequently a white back. The skin is thicker and less mellow than that of the short-horn; neither has the hair the mossy softness, or graceful curl of the latter. The eye is full and lively; the chest deep and broad; the loins also broad, and the hips well-expanded; a level broad rump, a round barrel, and full crop; full and deep flank, well-ribbed home; small bones; clean and perpendicular thighs; belly almost parallel with back; head small. Indeed, colour and symmetry are, perhaps, the predominant qualifications which secure the high favour of the breeder.

From the preceding description, it will be seen that the Hereford, though possessing many essentials in form, is destitute of those qualities which tend to produce early maturity and speedy fattening. He accumulates his flesh, soft and mottled, on the best parts; he has full sirloins, rumps, and crop; but he shows his beef all outside; and he requires much more *time* to develop his qualities than the short-horn. In milking qualities the Hereford cow is even behind the short-horn; and she must in general be three and a half to four years old before she can be fatted with any marked success. The breed requires a rich pasture; and their average weight, when fat, does not exceed fifty-five to sixty-five stones. Herefordshire being more a breeding than a feeding county, the cattle are reared there, and sold

off at three years old, in order to graze in the counties of Leicester, Northampton, and the rich grass districts. But with all the good qualities it must be admitted that they require from ten to twelve months more to feed than the more favoured short-horn. We give a sketch of a first-rate specimen.

THE HEREFORD COW.

Much controversy has gone on lately as to the merits of the two breeds—the short-horn and the Hereford. But it must be admitted, that while the short-horn is penetrating into the heart of Scotland and the south of England, and into the counties of Gloucester and Norfolk, the Hereford is scarcely keeping its ground. It is making no inroads into any one important new grazing district; and unless the gigantic efforts now made to amend the characteristics of the breed effect something more than heretofore, they will continue to dwindle away.

THE HIGHLAND SCOT.

Next to the Hereford, in the ranks of fattening animals, we place this long-horned breed of cattle; and well they deserve it,—for they will fatten where both the short-horn, aye, and the Hereford too, would perish. This West Highland breed is rather wild in its nature, and will not bear the least confinement, tying, or control. It is eminently gregarious, and if kept alone will generally fret and pine. The

THE WEST HIGHLAND BULL.

peculiarity of the breed is, that it is a small animal, generally deep jet-black, or light dun, seldom having any white spots on any part of the body. Its horns are long, and turned upwards and outwards. The coat is soft, long, and absolutely curled, so as to form a sort of fleece. Another peculiarity is, that these animals form their beef almost

entirely on the back, which is therefore straight, while the body is round; and they accumulate fat rapidly under circumstances in which another animal would literally starve.

Like the Jerusalem artichoke amongst plants, this animal can derive, from a soil so barren as to be sterile for others, as much as will enable him to feed—though to *grow* is out of the question; *that* process is performed on his native hills. If indulged, however, he will pay for loss of time by the rapidity of his fattening, and the excellence of his beef. These animals will weigh, with amazingly little care, from 48 to 50 stone, and some have been said to reach as far as 70. The exceptions to this rule, however, are very important in special cases. The Duke of Northumberland, having a very promising Argyleshire "stot" (bullocks as they are called more generally in England), kept him as long as he could, to see what he would weigh. He was five and a half years old, and weighed, exclusive of offal, 100 stones 4 pounds. Though, perhaps, one of the heaviest of the breed ever slaughtered, he was neither the fattest nor the most inactive, but seemed in that state which exhibits all the activity that he possessed on his native hills.

To convey an idea of his keeping, and of the hardihood of his race, it is only necessary to give an account of his food. In the first winter he was turned out to a poor pasture, with a little bad hay. In the summer he had again a poor land pasture. The next winter he had again a poor pasture, but a few turnips. During the following summer he had a fair pasture, and the same pasture in winter, with a more liberal allowance of turnips. The third summer he was tolerably well grazed. In the fourth winter he had as many turnips as he could eat in the sheltered straw fold; and in the summer in which he was fatted he had all the indulgence of a feeding animal, viz., cut clover, hay, mangel-wurzel, turnips, bean-meal, and a little oilcake; the latter of which he always disliked. Mr. Quarl says, "fat was distributed in an uncommonly equable manner, of a colour resembling the finest grass butter, and as firm as wax; the lyer (muscle) was in ample proportion, bright in colour, of fine texture, and beautifully marbled by admixture of his excellent fat."

On the preceding page is an engraving, from an original drawing, of a winner at Smithfield, of this class.

THE DEVON BREED.

If this had been a treatise on the drawing of cattle, we should have placed this middle-horned description of animals first in our list,

instead of almost the last. They are physiologically well formed animals, and are a very old and distinct breed. They are docile and tractable, patient and gentle, as well as hardy, notwithstanding their warm and humid climate; but they are not first-rate milkers, nor, if early fat is the grazier's object, are they very extraordinary feeders. Still they will feed, and grow to a considerable size. They produce a class of beef, at some periods of their growth, of fair quality.

The red colour—all red, and nothing but red—is a *sine qua non* in a Devonshire ox; he has a moderately straight top, a fine serene

THE DEVON COW.

countenance, a small head, and a somewhat thin skin, covered with curly hair. The rump is narrower than that of the short-horns, and the crop lighter and flatter; but the brisket is large and full, the legs fine, the shoulder slanting, and the neck long and thin. He is what would be denominated, in the short-horn districts, a "shelly" animal. He partakes too much of the Ayrshire or Alderney qualities to be a good grazer; and the cow has too much of the Hereford to be a

good milker. He is a beast of draught; and for this he is unequalled.

A short-horn breeder, in his prejudices, thus describes the cattle at a fair in Devonshire :—"With the exception of one animal, I did not see a level carcass; but a want of beef in the roasting parts, low and poor loins, coarse shoulders, bad twist (thighs), and a general want of indications of inside proof." Of the beef, when killed, he says—"The meat was actually running about the stall, being nothing more than a mixture of flabby masses, deficient of fineness of texture and quality."

Mr. Parkinson, in his invaluable and practical Treatise on Live Stock, mentions that a thin hide in the Devons is not quite a recommendation. He gives the weight of some specimens of six years' old cattle—drawn, doubtless, by Mr. Brodie—which weighed some 57 stone 2 pounds; but the cows much less. He says of them—"On the whole, they must he allowed to be good cattle for their soils, and particularly where oxen are worked at the plough. When slaughtered, they are a sort of beef that suits the consumption of many customers."

Amongst the most successful breeders of Devonshire cattle may be mentioned Mr. Turner of Barton, near Exeter. We give on the preceding page an engraving of one of his cattle, which is quite a model of the best of the Devons, and not by any means common. This gentleman is doing much in the way of cultivating early maturity in the Devon cattle. The specimens he has recently exhibited do credit to his skill and judgment, and tend to rescue the breed from some imputations which it is to be feared the greatest part of them deserve. It will be some time, however, before they maintain the high position given them by Mr. Youatt, who was evidently a better veterinary practitioner than a judge of the capabilities of the breeds of cattle. To suppose that they are the original breed of the island is simply absurd.

THE ABERDEENSHIRE BREED.

We shall conclude our remarks on the fat-producing class of oxen by shortly describing a hornless or polled race of animals—the Aberdeenshire "Doddies," as they are called. Being bad milkers, they are generally used for grazing, and very much fatted in their native country. They are also purchased for feeding by the graziers of Leicestershire and Norfolk. Their colour is generally black, but occasionally red; the head fine; the breast deep; the back not quite straight, being a little depressed at the loin, and somewhat narrow; the eye full and clear; the touch generally good, and the hair thick

and curly. The tendency of the flesh, like all the hardy Scottish cattle, is to form on the back; but they will weigh from 70 to 80 stones, and will even reach as far as 100 stones when five or six years of age.

The specimens we have selected will fully make out the correctness of the principles we laid down in judging of fat-forming cattle. Qualities are so co-existent with conformation, that this, as a general rule, may be received as an axiom. As it is clear that dairy and butcher qualities can only be combined to a very limited extent, and that both qualities can never be high in the same breed, it becomes the agriculturist to make his selection, according to the object he has in view.

CHAPTER IV.

THE PRINCIPLES OF CATTLE-BREEDING.

One of the most wonderful instances of man's supremacy over creation is the influence he is able to exercise in directing vital processes. Here his power is perfectly talismanic. Within certain limits he has the power of asserting his dominion so far as to make stern nature obey, and do his bidding. If he wants size or hardihood, activity or gentleness, milk or fat, nay, even wool, or mutton, or beef, he can so arrange the elements with which Divine Providence hath blessed him, as to bend, and mould, and adapt them to his will, until he has produced the kind and class of animal he requires. This power arises more from individual skill than from science! Whatever physiological principles are involved, they are best discovered by the facts known to the breeder, and teach him little in the management of his business. The perseverance and skill, the powers of observation and discrimination possessed by some breeders, have doubtless been the cause of their success, and led to England's becoming pre-eminent for food-producing animals; for in no other part of the known world can it be said that there is anything like such specimens to be found, either for producing flesh, milk, butter, or cheese.

To watch physiological tendencies, and avail themselves of all discoveries, was the practice of breeders long anterior to scientific research. Emulating the skill of the wily progenitor of the Jewish race, and intelligently perceiving what was required, Collins and Bakewell at-

tempted and attained the art of producing cattle and sheep "ring-straked, spotted, and speckled," at pleasure. Seeing also the necessity of economising food, they set about cultivating those animals which came to maturity early; and thus produced a much larger quantity of animal food from the same amount of vegetation. Knowing that fat was an element of favour in a northern clime, they endeavoured to obtain animals with a tendency to secrete it in large quantities. In order to do this, they observed the qualities indicative of these tendencies, and, knowing that it is true in physiology as in mathematics, that like produces like, they selected and bred from animals possessing them, until they stamped their qualities permanently and invariably on their produce. With these they managed to combine their usual concomitants, symmetry and beauty. Hence the origin of our flocks of Leicester sheep, and our herds of short-horn cattle, so intimately interwoven, even in their mortality, with the proud national boast of the "Roast Beef of Old England!"

There are in all animals, high as well as low, those exceptional instances where an individual far outstrips his congeners in some particular quality. Now, if another possessing the same qualities should be paired with this individual, there is certainly no guarantee that the produce will exactly inherit both. A knowledge of this fact has disheartened many a breeder. For instance, he wants milk; he selects for his female breeding animal the best milk-cow in his dairy, and carries her to a bull which is also the son of a dairy-cow of standing and character. He expects the produce to be a milker; but he is disappointed; and in disgust he retires and leaves to chance what he thinks he cannot obtain by skill and effort. He is in error. The principles of breeding are perfect; but he has not had the patience to wait for the fruit. One of his selections was an accidental product. She was not the successor of a favoured ancestry. She so far outstripped her race as to be possessed of qualities in which they were deficient; but her produce "kinded back,"—they resembled more the true breed of which she was an exception; and thus the breeder was disappointed in his expectations, and gave up on the first skirmish, instead of bearing the brunt of the battle. He should have gone on selecting the most famous for milk within his reach; and he would, by and by, have acquired, as a tendency of his breed, the accidental qualities which would have become the *rule* instead of the *exception*.

Hence the improvement of a breed of stock is not the work of a day or a year, but the business of a life-time. If a breeder were to start *de novo* to engraft some peculiar tendency on a herd of cattle or

a flock of sheep, it might be that his sons would reap the benefit of his skill and efforts, if they were rightly directed. There would be no certainty of the full qualities being established in two or three generations only.

There are not only limits, therefore, to the mathematical axiom that like produces like, modified by vital powers with which the breeder has to deal; but we think there is a principle deeper still, one little noticed by writers on breeding stock, yet one which all our great breeders knew and practised, viz., that some one animal has much more power of transmitting his qualities than others. We know at this moment a couple of gentlemen, who show the best short-horn cows and heifers, who may be said to have the best female animals perhaps in the kingdom, but who hardly ever get a prize for one of their bulls; and their best animals were all got by a bull who never was qualified to merit a single distinction. He had no great symmetry himself, but was coarse and ungainly; yet he had so much vital force that he impressed symmetrical beauty on all his progeny, be his partners what they might. He was thus the sire of a complete herd of winners. The remarkable results of the Collings in cattle-breeding were really due either to the skill they had in seeking this transmissive power, or to the accident of obtaining by chance an animal who possessed it—their bull Hubback.

Little as is known of this bull—for he was purchased of a cottager who grazed him in the lanes—it is quite clear that to have any merit as a short-horn, there must be more or less of the Hubback blood. Now the fact was, that when that animal's mother was taken to good keep, she ceased to breed, owing to becoming so fat. He soon did the same; but he was the sire of all the Collings' best cattle, and his grandson, Foljambe, was acknowledged to be the animal which most improved the herd—nay, the very sire of Comet. The bull Favourite was from the union of a brother and sister, whose common parent was this same Foljambe.

Thus in breeding animals the counterpart of each other, though it may not in the first generation prove all that could be wished, yet it gives the tendency in the breed to progress in that direction; and the careful and persevering selection of animals with the same tendency, through several generations, must have these results.

The difficulties now in the way of breeders are by no means those which met Bakewell, Colling, or Culley. They had to make a groundwork from raw materials, so to speak; and they had to carry them single-handed through every stage of their manufacture. At this time

it is different. In the present breeds of the country, there is sufficient variety on which to found any of the required qualities of animals; and the difficulties of selection are comparatively light. It requires, however, as much skill as ever to keep any one variety of animals foremost in the race, when there are so many excellent sorts to breed from. The original improvers therefore had perhaps less difficulty than the present race in maintaining their position. It is true they had to work without rules or experience, but they had the whole field before them, and they had fewer competitors. The race they improved was such, that every step they took was palpable and definite. There were fewer combinations of blood necessary, and consequently less risk of a failure. Now, the main effort is directed to overcome a defect. Suppose it is the very common one of a flat crop—a hollow behind the shoulder blade; that sire must be selected, whose peculiar physical conformation, in harmony in other respects with the herd, has this point in perfection. On the calves there may be little impression; but if they are again paired with another animal having a similar conformation, there will be more impression produced, and on a greater proportion of the herd. Still they will be variable; and it will require effort after effort, and a long process of attentive selection and rejection—*weeding*, as it is called—before it becomes a uniform characteristic of the herd, and the change be permanently sustained.

In speaking of the modes of improving a breed, the question arises,—how far is this to be done by the adoption of a male, or a change in the female animals. The universal consent, we may say, of breeders of all classes, seems to award the value to the male. The greatest care is taken in selecting a stallion; while the worst and most useless mare is sent to him. The flock-master will give from twenty to fifty pounds for the use of a ram, who would grudge to give five for a ewe; but it is, it must be confessed, somewhat different in cattle. The dairyman is very careful in selecting his cows. They are watched, as heifers, for the development of their good qualities, and are preserved either for their succession to a maternal race of milkers, or because they are promising in themselves; but the bull to which they are sent is too often a matter of convenience rather than selection. They know he is a bull, and that is enough. The too usual mode is to try the heifer by her first calf. If she promises well as a milker, she is kept for a cow; if not, she is consigned as a "drape" to the grazier for the butcher. Reasoning from analogy, the mother would be naturally considered as more influencing the animal than the sire. The influence of the mother is long and continuous. Her

blood flows through its veins, it partakes of her habits and sympathies; but still the vital force of the male animal is pre-eminent. Much as the mother may influence the constitution, the sire possesses a far greater sway over the conformation, the qualities, and the appearance. If, therefore, the object of the breeder is to perpetuate and impress the good qualities, and to remove the defects of his breed, he will be careful in the selection of both the sire and the dam of his breeding animals. A single failure—a single year's neglect—may stamp qualities on his race which it may take years to eradicate; for even to keep a breeding stock in a high state of excellence, is by no means so easy a task as may be imagined.

This brings us to the much agitated question of breeding *in-and-in;* in other words, of breeding animals solely from the same stock, all possessing more or less affinity for each other, and all originating in one or two varieties of animals. The controversy has raged from Bakewell downwards. He bred entirely from his own stock. Opponents to the system say his animals became small and feeble in constitution, and they failed. But he only adopted one of the first axioms of breeding,—he selected *the best he could find.* He saw and knew none like his own, and he took them because he could not find their equals. He attained high perfection by the system. He obtained a breed of good animals. They were attaining good qualities. He bred from them with each other, to give that breed permanency and uniformity, and indelibility to his flock and to his herd. Suppose he did get them small and delicate? His object was to produce animals less coarse, less gross, less hard than the original stock; and he succeeded, although possibly he carried his predilections too far.

Analogies are attempted to be made between the human subject and the brute. It is said that in the former the most serious physical and mental disorders arise from too near consanguinity. A family intermarries, afflicted with mania, or consumption, or scrofula. Intermarriage where these diseases exist will increase the virulence of the tendency, until the family become weak and feeble, or may become extinct. They do so, not because they breed in and in, but because they disregard the first principles of increase. They render permanent the defects of the stock by alliances of similar tendencies. Mr. Bates' maxim was, "breed in-and-in from a bad stock, and you commit ruin and devastation." They must always be changing to keep moderately in caste; *but if a good stock be selected you may breed in-and-in as much as you please.* If deficiency of mental power be a consequence of in-and-in breeding, surely it will be an advantage in *feeding*

animals; for the sensuous with them ought entirely to swallow up the intellectual, to make them profitable.

The objectors to consanguineous breeding, and its deteriorating and enfeebling character, seem to forget, that in the case of the wild cattle at Chillingham Park, to which allusion was made in the introduction, no cross has been made for an immemorial number of centuries; and thus, unchanged and unchangeable, they remain, without deterioration, without feebleness,—a standing objection to the indiscriminate condemnation of the system of breeding from the same stock.

The answer, that these animals do not show any improved points, is an argument in favour of this system of breeding. The fact that they never had them, and possibly never will have the chance, so long as the breed is kept pure and unalloyed, is quite decisive in its favour. Like all other wild animals, a natural law prevents the feeble male from exercising any unfavourable tendency. The herd have a king, and during the rutting season fierce and almost deadly battles take place amongst the bulls for the favour of the females. The hardiest, strongest, and most enduring male is the victor, and he becomes the parent of the future herd. This may and is likely to continue for some years, because, when once admitted a victor, a great change must take place before the contest will be renewed. No sooner, however, does the male animal become feeble, than another season renews the strife. The once proud patriarch is vanquished, and the youthful victor, full of vigour and virility, is in turn the paramour of the herd.

Now if we admit the influence of the male animal to be the greatest, we have here the most perfect adaptation for the weeding of the herd, and the best constitutioned bull is the parent of the whole race for two or three years of production. It is not wonderful then that they have no points, no superiority, no distinctiveness of breeding. There is no selection of adaptation, of symmetry, even of semblance; but there is strength of constitution in the male—the quality above all others best calculated for securing strength of constitution, hardness, and size in the offspring. Assuming that this tyrant strength in the patriarch of the herd will continue for three successive years—a feat extremely probable—there is a degree of consanguinity which few breeders will attempt. It may be said of Mr. Bates' herd, now that he is dead, that their quality was unsurpassed, and that the heifers were frequently bulled by their own grandfather, or the cow by her grandson; and this was no more irregular than the

wild habits of the whole herd at Chillingham, when the daughter, if not the granddaughter, must breed with the grandsire or the sire.

Mr. Bates and Mr. Bakewell were not alone; for Mr. Colling bred his animals in very close affinity; and Mr. Mason, of Chilton, second only to Mr. Colling, was an in-and-in breeder. But supposing the stocks of the Bakewells and the Collings became smaller and too fine in bone? Let it be remembered they were trying to reduce the size and improve the quality; and if they carried it too far, it is no more forcible as an argument against the principle, than any other want of judgment in the details is to any other system. No one will accuse Mr. Bates, however, after a jubilee of in-and-in breeding of the closest kind, of having either a small or feeble herd.

The very opposite to consanguineous breeding is the system of *crossing*. When two distinct kinds of animals are made to breed with each other, a distinct variety is produced, called a hybrid or mule. Now there is not, externally, a greater difference between a Shetland pony and a donkey, than there is between a Durham short-horn and an Irish long-horn. But zoologically there is a more marked and distinct dissimilarity. Now, when the zoological difference is beyond a given range, nature interposes, and will permit no further admixture. Mules are almost invariably unproductive. But with ill-assorted crosses of different breeds of cattle she operates another way. The union of a male and female, of different qualities, will sometimes produce a happy combination of the qualities of the two, and considerable uniformity in the produce; but the union of these products again, amongst each other, instead of inducing a greater uniformity, ends in a crowd of mongrels, differing from each other as much as from their grandsires, and possessing the conformations and qualities of neither. For instance, a cross was attempted between the Herefords and the Devons,—the fat-forming Hereford and the active working Devon. The cross was a failure. The power and activity of the Devons were lost, and their working qualities impaired; yet they did not fatten like the Herefords. A cross of the same with the Alderney improved indeed the dairy qualities of the breed, but lost the muscle so necessary for work and the capacity for feeding; so that this cross was also a failure. Again, a cross has been attempted between the Hereford and the Kyloe breeds. This, it might be supposed, would improve the back of the Hereford, give hardiness, and keep up the aptitude to fatten; but no, the cross had the fattening qualities of neither, and the quietness of the Hereford was lost in the wild habits

of the Kyloe, although the bull was a Hereford, and the cows were of the Highland breed.

Coming to closer approximations of character,—a cross between the dairy Ayrshire with a short-horn in all his grazing aptitude does not succeed, simply because in the Ayrshire itself, particularly the improved breed, a good struggle goes on between fat and milk, which ends in diminishing the latter in quantity, and sending the fat through the udder in the shape of butter. A short-horn cross decides the contest; it gives up the Ayrshire to the grazier, and takes her from the dairyman to consign her to the butcher.

The most successful cross ever made, perhaps, even by the great Colling himself, was between the Galloway cattle and the improved short-horn. But he adopted the only mode of crossing which, in the circumstances, seems to be feasible. One of his short-horn bulls was put to a well-selected Galloway cow; and the produce of this union was a bull. He proceeded no further with this cross, but carried back the blood to his short-horn herd. To this bull he put a short-horn heifer, with a large succession of Hubback blood. The result of this union was another bull, the sire, amongst others, of his cow, Lady, which at the sale sold for 206 guineas. It is by no means improbable that the straight back, the rotundity of form, and the width of hips were due, in some measure, to this Galloway cross, as well as that shortness of leg, the most obvious defect of the Teeswater cattle, which the Collings were so anxious to improve.

So much for the union of a Galloway and a short-horn, for the purpose ostensibly of improving the short-horn breed. This cross, whatever may be said of its inroad into the purity of the blood, is certainly a most successful and most judicious instance; for where a large and powerful-framed animal is covered with a short-horn bull, quality and aptitude to fatten is given. To go further is not judicious; to attempt a cross with a milk-producing cow is unnatural and absurd; but there is no sort of large-framed animal intended for the grazier, which would not be improved by a cross with the short-horn for one generation. With the smaller West Highland cattle, even for grazing, we should have doubts. They lived in a hard, bleak district, to which a dash of short-horn blood, however small, could hardly ever accommodate itself; but to the larger Scottish breeds a single crossing would be invaluable. This may be strikingly instanced in the case of a cross between a short-horn bull and a large Aberdeenshire cow, to which was awarded the prize by the Highland and Agricultural Society of Scotland, in 1834. The live weight of this cow was 224

stone, of 14 lbs. to the stone; and she weighed when killed 173 stone 3 pounds.

To attempt a greater proportion of short-horn blood is to run a risk of losing the hardihood of the northern tribes of cattle, without giving much more aptitude to fatten. It is certainly true that the maturity of the breeds might be accelerated. We might see the Galloway a cow at two years old; but even this must arrest the hardihood of the breed, impair its endurance of a northern blast, and waste in winter the advantage gained in summer.

It is questionable, however, where crossing is to stop. Some very grave facts have been arranged and classified to show that when a pure-bred animal has once been impregnated by one of another breed, such impregnated animal is thereby for ever afterwards a cross, and may be expected to produce cross-bred and no more pure-bred young. But the notion is capable of being carried further still,—that a female animal will always produce young resembling in character the animal by which she was first impregnated, whether of a cross breed or of the same breed as herself. Now, if this approaches to correctness, and if a single cross will stamp its character for ever upon the animal which is the subject of it, there arises the necessity for the utmost caution in selecting a male animal, especially in the first impregnation of the female.

The hypothesis of Dr. Harvey of Aberdeen, and Professor M'Gillivray is, that the intimate connection, at least in bovine animals, between the fœtus and its mother—consisting of an absolute circulation of the blood of the fœtus through the veins of the mother, and *vice versa*—so impregnates the mother with the vital functions of the sire, as to render her for ever afterwards incapable of transmitting her own unimpaired qualities to her progeny; thus making her partake of the character of her first young, whatever be the defects or peculiarities of the sire.

The case of the Earl of Morton's chestnut mare, which was put to a quagga, or wild ass, is well known. The produce gave the most unmistakable signs of the quagga in its head, its ears, its stripes on its shoulders, &c. Afterwards, in three successive seasons, the mare was put to a black Arabian horse, and in as many years did the foal strictly resemble the quagga.

In 1821, as related in the *Transactions of the Royal Society*, Sir Gore Ousely had a thorough-bred mare covered by a zebra. The produce was a striped animal, resembling of course its sire; the mare was afterwards covered by a thorough-bred horse; but a striped

animal was the result; the year afterwards she was put to another horse, with the same result. Six black-faced horned Scottish ewes were selected by Mr. H. Shaw of Leochel, and were served in 1844, some with a Southdown, and others with a Leicester ram, the one a white-faced, the other a dun-faced, but both hornless rams. Of course the lambs were crosses. In the following year but one, they were put to a horned ram of their own black-faced breed, but all the lambs were hornless, and their faces of a brownish character. Again, they were put to a very superior ram of their own breed. On this occasion the crosses of some were less distinct, but two of the lambs were polled or hornless; one was dun-faced, with very small horns, and the other three were white-faced, with very small round horns only. The ewes were considered so spoiled and impure, as to be put off from the flock, and he never obtained from them another lamb.

Dr. Hugh Smith's case with his favourite setter bitch is a remarkable fact in point. Following him one day in the season she was warded by an ugly cur, and the setter was so degraded that he shot the cur. Dido, however, mourned the loss of her nose in the partridge season; she was put to a superior setter; but lo, her produce were the colour and picture of the cur; and in her many subsequent litters no other kind of animal could be procured from her but a cur-looking puppy.

Take another instance from a pig. David Giles had a black and white sow which became pregnant by a wild boar, of a dun colour. Of course the breed was mixed, or crossed, showing symptoms of the qualities of both its parents. But the same sow was afterwards put to two different boars belonging to Mr. Western, and in both instances the dun colour prevailed in the breed, though perfectly unusual before.

But the case of an Aberdeenshire heifer, mentioned by the late Professor M'Gillivray, is more in point in a treatise on cattle. She was put to a short-horn bull, being hornless herself, and had her first cross calf to that animal. She was afterwards put to a pure-bred bull of her own kind; but she again had a cross calf, a horned animal, though both its parents were hornless.

Another instance is mentioned, by the same authority, of another Aberdeenshire cow which had been served by a first cross between the Aberdeenshire and short-horn, and to this animal she had a cross-bred calf. In order to have a pure-bred calf from her she was put to a pure Aberdeenshire bull; but the produce was a cross calf, both in colour and appearance.

It is extremely difficult to resist evidence of this kind. So many facts tending the same way almost lead irresistibly to the conclusion that there must be a sort of impregnation of the whole system by the first animal in the cases stated, and that this influence has continued through the remainder of the animal's life, weakened perhaps through time, but still leaving abundant traces of the effects.

But, what is more remarkable still, there are instances of resemblance where there could have been no impregnation whatever. It did not appear, even in the case of Dr. Smith's Dido, that the intercourse with the cur, if any, had been fruitful; but the following facts will show the impossibility of any connection whatever. Mr. Blaine had a pug bitch which made a companion of a small white spaniel, from which she was separated on account of her heat, and she was warded by a dog of her own breed. She brought puppies, one of which was slender and spaniel-like, and perfectly white; and in two subsequent litters she always had one white puppy, though it might be less slender than the first. It is true, that by possibility she might at some period have had unobserved intercourse with the spaniel, in which case the principle would be the same as in the previous cases.

The next case, however, is one where this was impossible. A mare and a gelding had long been companions in the team, in the pasture, and in the stable. He was black with white legs and face, and had a singular rectangular form of hind legs. After some two years' association like this, the mare was covered by a bay stallion, with black legs, like herself. The foal exactly resembled the gelding in colour and shape, especially of his hind legs. Here connection was, of course, impossible.

We shall give one instance more, tending to show that the effect is in some cases produced through the imagination of the mother. Mr. Boswell relates what he considered a well-authenticated instance, of a hornless cow coming in season when one of his neighbour's horned black-and-white oxen broke over the fence, and accompanied the cow home to the bull; both the sire and dam were black and hornless, nor had the farmer any horned or spotted beast on his farm. The produce of the cow was black and white; and in due time its horns grew, resembling those of the ox. If the same neighbour had not also a black-and-white horned bull, the fact is very important!

Little as these facts prove in themselves, they raise a doubt as to whether the imagination of the mother may not, in some indescribable way or other, operate upon the offspring; and in something like proof

of this is the wily and politic conduct of the patriarch Jacob, who peeled poplar and hazel staves to induce the strongest sheep to bring forth ring-streaked lambs. But whichever principle be right, it is evidently far safer to run no risks with very superior animals, and to cross only with those whose subsequent progeny is of less consequence.

It is sometimes desirable that the farmer should possess the power of *controlling the proportion of the sexes in the animals he breeds.* The wonderful ratio in which they are produced in nature, is one proof of the all-wise provisions of the Almighty in reducing them to certain laws. Many investigations have been made to show how far this is within the control of man. A dairyman is particularly interested in the production of heifer calves, wherewith to increase his dairy stock; a grazier may be equally desirous of producing bullocks for large weights and summer grazing; while a breeder for sale may be anxious to see a goodly proportion of bulls. How far he can control this production, is a question of interest and importance. Hofkener, a German, made some calculations as regards the human species, which tended to show that where the father was younger than the mother, the proportion of male births to females was 90·6 per cent.; when of equal age, 90 per cent.; but when the age of the father was greater than the mother (say nine to eighteen years), it was 143 per cent.

Similar in principle was the experience of M. C. C. de Buzareurgnes, who professed to have the power of controlling the sexes in sheep; his principle being the same as the above, viz., that vigour was favourable to female, and the converse to male births. For females, he proposed to select young rams, and place them in a good pasture; for males, three to five shear animals, and place them in an inferior pasture. His experiment was successful. In his female trial there were seventy-six female lambs produced against thirty-five males; and in his male trial there were produced eighty males against fifty-five females. Another trial was made by M. Cournuejouls. One section was put to young male ram lambs, and on a good pasture; the other on a poorer pasture, and with old rams. The result was, that in the first experiment there were fifteen males and twenty-five females, and in the second there were twenty-six males and fourteen females.

Buzareurgnes also showed that in several lots the approximations to male or female births were in the ratio of the ages of the animals on both sides. Thus, of the young ewes put to the young rams, the

two-year old ewes produced fourteen males and twenty-six females and the three-year old sixteen males and twenty-nine females; while the four-year old ewes, to the aged rams, and on the poor pasture, produced thirty-three males and fourteen females.

More than this is not known; but there is quite sufficient to indicate that the breeder possesses at least considerable power in controlling the proportion of the sexes, and that the more vigour he has of frame and food, the greater will be the proportion of females; and also that the converse will hold equally good. There is enough in the principle to deserve a trial.

CHAPTER V.

DAIRY MANAGEMENT.

Of all kinds of food milk is one of the most important. Perhaps it is the only one which contains within itself all the elements of food, and in such a form as may be most easily assimilated, and rendered fit for the building up a feeble and delicate structure. This nourishing substance, referring especially to the milk of the cow, contains a variety of proximate and ultimate principles; and every part of it is more or less useful in providing food for mankind.

In one or other of its forms, milk is in great request, either as a necessary of life or an article of luxury. The young of our large and populous cities make it a considerable portion of their food. In the shape of cream, the almost universal consumption of tea and coffee has placed it on the tables of the peer and the peasant. In the form of butter it is again present at our tables as a condiment to our bread, and an ingredient in our pastry; while as cheese it again appears either as part of the diet of the poor, or a conclusion to the feast of the rich;—not to mention other productions of which the cuisine art has taught mankind the use, in order to pamper the appetite, and increase the means of luxurious gratification.

Milk consists chemically of three parts,—a watery or aqueous portion, in which its sugar and salts are dissolved; an oily or oleaginous, and a solid and albuminous principle. It thus affords in turn a supply of the materials for replacing the waste of the old, or constructing the new animal which partakes of it. The saline and saccharine part forms at once the solids of the system, and the means

of sustaining animal heat; the oleaginous furnishes the reservoir of fat, to be available in times of adolescence or scarcity; while the albuminous part gives the means of forming sinew and muscle. Thus milk is the *multum in parvo* of mammalian food.

A little before parturition, the new sympathies of the system cause the mammiferous glands to swell and enlarge. Adolescent before, they now become ready for energetic action; and no sooner is the young brought forth, than the aliment of nature is ready for the sustenance of the being which, so short a time before, derived its subsistence from an internal source, as it is now preparing to do from an external one.

If the milk taken from the cow be allowed to stand in a shallow dish, a change takes place in its appearance as soon as the cooling process begins. A whitish-yellow substance, thicker than the milk, separates from it, and swims on the top, forming an adhesive coating over the whole. This is the cream—the richest part of the milk—which leaves the mass below thinner, and of a bluish tinge, well known as skimmed or blue milk. If the upper layer is examined by the microscope, it will be found to consist of a large accumulation of minute globules. These globules are the oily or butyraceous parts of the milk, coated with a thin covering of a more solid substance; and this may be separated from the mass almost entire. Here you have the greatest part of the butter, with some mixtures of other matters. We say the greatest part,—for some of the globules of oil, or fatty matter, are still suspended in the milky mass.

If the milk so skimmed be allowed to remain, a further change takes place, more or less rapid, according to the temperature. In hot weather this is very rapid. The albuminous or solid portion of the milk is one which contains an ammoniacal principle, and is liable to run very rapidly to decay. It begins to ferment, and an acid is formed, which immediately determines the solid parts of the milk by uniting with an alkali that keeps the solid part of the milk in a state of solution. Under these circumstances are formed two substances, technically known as curds and whey. The solid portions are distinctly developed, and descend; these are the curds. The watery particles in which they were before dissolved are also determined, and become the whey. If these be now separated, the solid parts—acted upon by the changing agency of the nitrogenous matter, having moisture, heat, and air added—soon show signs of putrefaction. If the whey, or watery part, is then suffered to ferment, and is exposed to sufficient heat and plenty of air, another kind of fermentation will

take place, and a slightly alcoholic drink will be produced, which is used for exhilarating or intoxicating purposes by some of the inhabitants of the north-east of Asia.

The separation of the cream from the milk does not take away all the oily or butyraceous matter from the milk, nor does it remove the whole of the solid (caseous) matter from the cream. The envelope of the oleaginous globules is of this same albuminous and changing substance; and in this, by absorbing oxygen from the air, a change also takes place. Curds and whey are formed in the cream itself, but intermixed with a considerable quantity of butter. This butter may be separated in various ways. Heat will send it to the surface by breaking the enveloping globules of casein; but being merely animal oil, it has an insipid taste, and is very different from our table butter. Agitation, with warmth, especially after incipient fermentation has gone on, is the most effectual mode of breaking the globules, by fracturing their enveloping skin; and this is the well-known process of *churning*, of which we shall speak more fully in reviewing the several dairy systems.

In considering the constituent elements of milk, let it be remembered, in the first place, that it contains 87 parts of water, rather more than 4½ parts of sugar, a little more than 3 parts of butter, something beyond one-half part of saline matter, and 4½ parts of cheesy matter (curd or casein). Its weight, from containing so many matters in suspension and solution, is about 3 per cent. greater than that of water. The milk of different animals, however, contains different proportions; and this differs again according to the breed, food, and treatment of the animals. The following exhibits a few of these differences:—

	Cow.	Woman.	Ass.	Ewe.	Mare.
Casein (curd)	4·5	1·5	1·8	4·5	1·6
Butter	3·1	3·6	0·1	4·2	trace.
Sugar	4·8	6·5	6·1	5·0	8·7
Salts	0·6	0·5	0·3	0·7	89·6
Water	87·0	87.9	91·7	85.6	
	100·	100·	100·	100·	100·

Now all dairy operations are aids for developing or arresting the natural changes of milk; and if we give a faint outline here of the principles of these processes, it will very much assist in determining the relative value of the different dairy systems, when we come to details.

The object of the dairyman is sometimes to assist and sometimes to retard the natural stages of decomposition into which milk will run when left to itself. Sometimes it is necessary to defer, sometimes to hasten these stages, and he possesses great power for controlling them. Heat, it will be seen, is necessary to all these stages of action. Hence in winter he can easily arrest, and by artificial application as easily advance the manipulations of his craft. But in summer it is not so easy to control. He has often to be in his dairy watching his milk under the influence of the sun's rays; and he contrives his dairy so as to keep out the hot rays of the sun as far as possible; or he endeavours, by evaporation or profound shade, to counteract their influence.

To begin with the new milk,—it is by no means necessary that the cream should be separated from the milk. If butter be the object, it can be attained without any separation of the cream. There are two modes of breaking the globules of casein. One is by the application of a gradually-increasing gentle heat to the new milk, until the buttery matter floats at the top, which is then taken almost in a boiling state, and churned to butter in a very few minutes. The other is, by at once applying the beaters of the churn to the whole mass of the milk; but, as the bulk of liquid is so much greater in the latter case than the former, and skim-milk is of greater value than butter-milk, this is much less frequently resorted to.

Generally the cream is allowed time to ferment. This process aids in breaking down the structure of the enveloping skin, in precipitating the casein of the mass, and thus assisting the maturation and development of the butter. In churning, the heat of the mass rises from five to ten degrees; and in very cold weather it is sometimes necessary to pour in boiling water, in order to obtain the necessary heat. This heat is also indispensable in separating the cream. At a temperature nearly freezing it will rise with difficulty. Perhaps the most regular and healthy temperature is 55°; but so rapidly does it rise at 76° or 77° as to require great skill and attention to prevent the whole mass becoming sour. At the first-named temperature it will be perfectly raised in twenty-four hours; but in the latter state of the temperature it will be complete in ten or twelve hours. As the globules have to rise by specific gravity chiefly, it is desirable that the milk should be disposed in shallow dishes. Glass is clean and beautiful, and porcelain is fashionable; but lead is the old-fashioned and useful medium: it retains the heat of the hot water from the scalding process in winter, and slowly conducts the heat after the cooling from evaporation in summer. The desirable temperature in churning

cream is 54° to 55°,—a degree of heat preservable only in summer by early churning, and in winter by raising the temperature with boiling water, and heating the cream at the fire before placing it in the churn, or by adding boiling water to the mass in the churn.

Besides the matters we have mentioned as being present in milk, and consequently in its products, we must not omit the aroma of the food consumed by the cow. In the case of turnips this is very distinct, and sometimes very disagreeable,—causing even pastry to partake of the undesirable flavour. In the spring of the year milk will even have a bitter taste, from the vigour and freshness of the herbs consumed by the cows at that season.

The milk, immediately after calving, is thick and yellow; and in this state it is called "beestings" or "beaslings." This is more abundant in casein or curd, and on this account often forms part of the elements of the curd sold for the purpose of making cheesecakes. Chevalier and Henri gave the composition of these as follows:—

Mucus . .	2·0	Casein . .	15·0
Butter . .	2·6	Water . .	80·3

The afterings, or strippings, (in other words, the last milk taken from the udder of the cow), are by far the most abundant both in cheese and butter; and hence some dairymen make it a practice always to strip their cows themselves, even when the milking has been left to their servants.

The qualities of cream depending on the modes of management as well as the food, vary much in the different breeds. Thus, in some experiments made, it required twelve quarts from a short-horn cow to produce one pound of butter—something like a day's supply of milk; while nine and a-half quarts of an Ayrshire cow's would give the same quantity; but it is often very variable in the same animal at different periods, and different animals of the same breed will produce very different results both in cream and butter. It is generally necessary to add some colouring matter to the butter. Annatto is used in some places; but the best colouring is the juice of carrots. They may be grated, and the juice strained off. This is both innocuous and effectual.

The churning operation is usually most successful when speedily performed. Though 55° may be the most desirable heat, it sometimes requires more. If the cows of the dairy have all been long calved and the weather is cold and stormy, the operation becomes long and protracted; and when ten and twelve and even fourteen hours have been consumed in churning, not a few charms have been invented to

hasten it. Usually, however, if briskly turned, the process will he accomplished in twenty minutes. The first sign of hutter is when it is in "shill;" that is, when the caseous matter is separating from the butyraceous. The hrisk motion requisite to produce this state of things must be softened, when the small particles of butter hegin to adhere to each other; then the butter-milk must he partially let off, and the gathering process, which will continue for ten minutes more, will be complete.

The butter, however, is still in a state far from being fit for use. It contains much of the eheesy matter, and repeated washings in cold water are necessary to secure its removal. If this should not be carefully done, the butter will soon hecome rancid. The tendency in the caseous matter to decay will induce its speedy decomposition, and also the formation of a variety of substances, especially butyric acid, which has a most disagreeable smell. For the same reason, it is essentially necessary to observe the utmost cleanliness in the dairy. The surgeon who punctures his finger with the dissecting knife, dies of mortification; fresh heef placed in a hasket, or in a room whcre beef has been in a state of decay before, will soon putrefy; and a very little putrefied milk spilled upon the ground, or left in the churn, the pail, or the bowl, will soon so communicate itself to the whole of the milk and cream in the dairy as to spoil churning after churning of the hutter it contains.

Professor Trail made several experiments with the different modes of churning. He tried the churning of fresh cream, of fresh milk, of soured milk and cream together, and of the scalded cream. The results of these experiments were not very different from what had been previously taught. They were, first, that the addition of cold water to thick cream in hot weather assisted the churning hy facilitating the separation of the butter; then, that cream alone, in whatever state, chnrned with more facility than when mixed with milk; that butter from fresh cream is the finest, and keeps the best, hut the butter-milk from this is somewhat poorer; that the scalding of the cream, after the Devonshire method hefore alluded to, yields the largest quantity of butter, but requires immediate use, as it soon becomes rancid. His last remark is, that the most economical mode is to allow the cream to he soured, or fermented, as it is sometimes called—though it is a change which is not strictly fermentative—because by this process it yields the largest quantity of hutter, and the hutter-milk is also the hest.

Circumstances, as well as peculiarity in the management, will have

great influence on the flavour of the butter. Thus, where calves are fatted for veal, there is often the best butter. The calves are allowed to suck the cows before the milk is taken for the dairy. In this case, the calves get the solid and saccharine part of the milk, and the dairyman all the afterings. Hence he secures a large quantity and a rich quality of butter.

The Bretagne butter, so celebrated in France, owes its peculiar qualities to the mode of its manufacture. It is in such demand that it becomes a manufacturing process; and hence it is made in large quantities—a circumstance always favourable to the quality of butter. The process pursued with this butter is as follows:—After churning and washing, the butter is steeped or sprinkled plentifully with new milk, and kneaded into cylindrical cakes, and placed, for a few minutes, in a sort of covered frying-pan, with heated coke both below and above. It is then taken out, and is fit for immediate use. The flavour is peculiar, and the butter particularly rich in flavour.

The real secret of butter-making, it appears to us, is so to arrange the *temperature of the dairy* and the churn, as just to maintain the requisite degree for thoroughly separating the cream; but not so great as to render the whole over sour. If too cold, the butter will separate badly; the churning will be long and tedious, the butter full of breaks, pale in colour, and brittle in texture; and if, on the contrary, it is too hot, it will be light and oily. It is also essential that the cows should not have calved too long. This will retard the churning process, and have a tendency to make the butter both bitter and unpleasant. Perhaps the best butter will be made from one-half soured cream and the remainder fresh. Enough of the lactic acid will be formed in this portion to facilitate the churning; and enough of caseous matter will be left in the other to prevent its being tasteless.

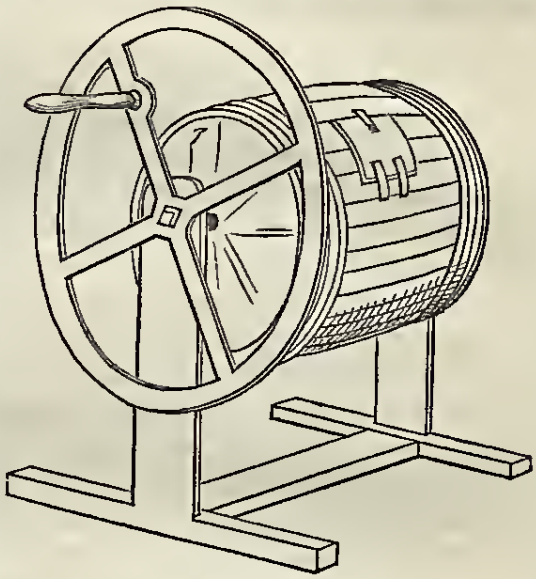
If butter has to be kept, means must be adopted for its preservation. The souring change soon proceeds; the butyraceous matter changes also into several disagreeably smelling acids. The first mode of preservation is by salting. If it is to be removed far, it may be necessary to pack it well, and exclude the air. Hence, when it is made on a large scale, it is put in firkins, or casks, holding from three to five stones, which are carefully fastened up by the cooper, so as to exclude the air. Salt is well known to have the power of preventing animal matter from falling into the putrefactive state, by means of its peculiar antiseptic power, which prevents the caseous matter of the butter from becoming putrid, and running into decay. But such is the affinity of salt for the moisture of the atmosphere, that the outer

portions of the butter soon became subject to the changes which contact with the atmosphere produces. In order, therefore, to keep it for any length of time, it must either be covered with a saturated solution of salt, or with a syrup of sugar, which has the same effect. Otherwise it must be placed in casks which are air-tight, or nesrly so, with the top and bottom dredged with salt. In fact, the more the moisture is attracted from the atmosphere, the more closely will the wood of the cask adhere, and *vice versa.* A very important means of preservation is thus afforded to the dairyman, and to the inhabitants of our large towns; for without this, even with all our facilities of railway transit, it is difficult to conceive how a constant supply could be maintained. The firkins made in summer are opened in winter; and, thongh not so rich in their contents as the fresh products from the dairy, they form a second-rate class of butter, by no means disagreeable, called kennel butter. When these are opened for use, a very free washing should be given them, to wash out the soluble lactic acid; and the butter should afterwards be well washed, and kneaded in new milk. This gives it much freshness and flavour, which improves and renders it, if well made and packed, much more pleasant than some of the turnip-flavoured fresh butter made in winter.

When once the rancid taste of butter has been acquired, it is never again fit for the table; but it may be so purified as to be by no means useless for pastry purposes. The disagreeable acids are all, to a certain extent, soluble in water. Butter should, therefore, be placed, in clear fresh spring water, over a slow fire, and kept there until the water boils. This will evaporate, wash out, and volatilise the acids. It may then be skimmed off, and put in fresh cold water, again to undergo the boiling process. If after this it be washed thoroughly, it will be found free from any bad effects upon pastry, but very insipid, and unfit for the table.

As to *the form of the churn* there may be a varicty of opinions. The ultimate object is to secure that form which will facilitate a rapid, steady, and shaking pressure of the contents; and this is effected either by a flapper, driven through the cream, at a considerable rate, by means of a piston with a perforated base; by a perpendicular motion, raised up or down in a cylindrical or similarly formed vessel; or, what is more common and by no means the worst form of churn, by a cylinder studded with perforated beaters, fastened to its inner surface, revolving round its two axles, and admitting of one handle or two, according to the quantity of the cream. By this means the specific gravity of the cream, and also the force and impetus of the machine, are both

brought into action to excite the heat, the pressure, and the agitation necessary to the proper and speedy development of the butter. To this, horse or steam power may easily be attached, and though there have been many forms of churn in use, we are not certain that any very great improvement on the above has so far been discovered. Plans have been adopted to diminish the labour; but this has often ended in defective operation. The American and the table churns, available for the immediate manufacture of butter every morning for the tables of the rich, are so far a step in advance, and a luxury; but for the large operation of the dairy-farmer, a better application than the churn of his forefathers has not yet been discovered. We give a sketch of a useful kind of modern churn.



THE BARREL CHURN.

The principles of *Cheese-making*, in many respects, are those applied to the manufacture of butter; but the object being to a certain extent different, they apply in a different manner. The production of the different kinds of cheese will more appropriately come out in the details of dairy management in the different localities to which we shall have occasion to refer; but they all centre in the artificial development of the cheesy matter (casein) of the milk, whether the milk be new, or that from which the cream has been taken, termed skim milk.

It has been stated that, if left to itself, lactic acid, into which the sugar of milk is changed, soon begins to form, when the air and temperature are favourable to its development. If to this mixture heat is applied, so as to dilate the caseous matter, we should have genuine curd, fit for the manufacture of cheese; but the cheese would be unpalatable, brittle, and hard, and the process too slow for the purposes of commerce. Hence some substance is required to facilitate the change. Lactic acid, natural or artificially added, will combine

with the soda which holds the casein in solution, and form lactate of soda. Here the acid will, with the addition of a little heat, be developed. For this purpose various means may be adopted. The most common is the addition, in some form or other, of the very substance nature herself has provided for the abstraction of the casein, that is the stomach of the calf, or some mammalian, generally a ruminating animal. The stomach of the calf curdles the milk in its natural state; and often this curdled milk, the contents of the calf's stomach—the animal having had first a full meal of milk given to it—is withdrawn, and used to produce the change in the milk intended for cheese. The idea seems neither pleasant nor cleanly, nor is it necessary. The stomach itself, if well washed, chopped to pieces, and steeped in water for several months,—as many as twelve being in many cases advised —and reduced either to a liquid or powder, or even the skin itself, is equally potent in effecting the coagulation of the milk. The notion that it is the gastric juice of the stomach which curdles the milk, though it will doubtless have that effect, is exploded by Professor Johnston, who satisfactorily shows that the change must result from some acid in the structure of the rennet itself, and not merely from the gastric juice, — especially in the cases where it is considered necessary that it should remain for twelve months steeped in water before being fit for use.

The rennet, however, is not the only material used for striking the curd, or hastening the coagulation of the casein. In some cases muriatic acid is used. This acid transfers the alkali of the milk into common salt (muriate of soda). Being diluted with water it has the same effect as the rennet. Vinegar, tartaric acid, alum, and even occasionally milk, are all used with success; each having in it acid enough to effect the purpose, under favourable circumstances. A considerable part of the fatty matter of the milk will, of course, unite with the curd; but some will remain in the liquid, or whey, as it must now be called. In the case of new milk cheese, the whole of the milk, immediately it is taken from a cow and passed through a fine sieve, is subjected to the action of the rennet. In cases when a full meal of milk will not produce a cheese, the milk of the evening is reserved till the morning, both added together, and the rennet poured upon the mass. As something like 95° is the heat at which coagulation and contraction of the curd is performed with the greatest rapidity, the milk should be raised to about that degree. If more heat than this is given, the cheese will be tough and waxy; if less, there is some difficulty, owing to its softness, in separating the

cheesy from the watery matter. In cold weather a small quantity of hot water has to be added to the new milk with the rennet; but if much water is added, or the temperature interfered with more than necessary, it injures the quality of the cheese.

The next process is the cutting of this curd, to separate it from the whey; and this is a manipulation which requires care on the part of the operator. If done rudely or rapidly, it will burst the mass, and press out the butyraceous particles; but it must not be delayed after the curd is formed, or the whey will obtain more than its legitimate share of the butter. The process of draining away the whey, held in loose attraction by the curd, is to cut it in pieces, and lay it on a strainer; then by the application of slight and equable pressure to take away the remaining whey. As little force should be used as possible at first; but, as the first portion of whey is drained off, the curd will acquire more power to retain the fatty matter. Forty or fifty pounds weight will be as much as it can bear at the commencement of the process.

Nearly the whole secret of cheese-making depends upon thoroughly draining off the whey. This carries off the sugary matter of the milk, the lactic acid, and perhaps also the rennet. These substances are so liable to undergo changes, that cheese-making altogether depends upon this process being properly attended to. In some places even the curd is washed; for little injury, beyond the danger of washing out a little butyraceous matter, would be sustained, compared to the loss incurred, if the cheese were suffered to retain any considerable portion of the whey. Besides, as butter is sometimes churned from this whey, the loss is made up to the dairyman, if not to the consumer, in another way.

So powerful is the tendency of the albuminous matter of the casein to putrefy, that even cheese itself will not keep, unless the salting process in one shape or another is adopted. This is performed in the manner most favourable to the production of the peculiar kind of cheese for which a district may be famous, and is either added to the curd, or *rubbed in* after the cheese is made and strained. Such is the affinity of salt for moisture, that it will soon permeate the whole mass of the cheese, and preserve the casein from putrefaction by its peculiar antiseptic qualities.

The next process is that of *drying and turning;* but as these are matters of detail, which will come under review shortly, they need not be here described. The only remaining subjects requiring notice, are the general care and attention necessary to be exercised, in order

to preserve the character of the cheeses of a district, whatever the peculiarities of manufacture may be.

If scrupulous—nay fastidious—cleanliness be necessary in the process of butter-making, it is equally necessary for the making of cheese. The flavour of a cheese may be much more easily destroyed even than that of butter. Decaying matter in the dairy will send out its sporules, undiscernible even by the microscope, and infect the whole place with its miasmatic influence. So long as the dairy is not a separate room in the house, kept aloof from the food of the family, from the decay and putrefaction of animal and vegetable matter, unconnected with household duties, and in the most absolute state of cleanliness, there will be injury and loss to the dairyman.

Allusion has been made to the taste of turnips inseparable from the milk and butter of cows fed on that root. As the bulk of the cheese is made in summer, the remark does not so far apply to cheese; but it is not unapt to obtain a flavour from any herbs upon which the cow may have specially fed. This aroma of the milk may be often removed by the addition of a little saltpetre; and Mr. Huxtable recommends a few drops of chloride of lime, to remove entirely the taste of turnips. We know a clever dairy-woman who evaporates the essential oil of the turnips in a very ingenious way:—As soon as the milk is strained—"siled," as it is locally and technically designated—she adds a gill of boiling-hot water to three gallons of milk. This seems to have the tendency to distil out the aroma of the turnips in a very complete manner, both from the milk and its products. A little prudence, however, will generally obviate the injury arising from any special kind of food, with which the cows may at any time be fed.

The *inoculation of cheese* is one of the refinements of modern taste and luxury. A blue mould is by some considered the *sine qua non* of a tasty cheese; while others prefer the decay to be grey, and the cheese to be in a state of putrefaction so absolute as to be soft and wet—a nidus for mites and the jumpers!

If it be desired to give to a cheese, especially a Stilton, the flavour peculiar to one of its kind, it may easily be accomplished. A dozen holes may be made in the specimen to be operated upon, with the common cheese trier, and the pieces taken away. The same trier may cut as many pieces out of the favourite cheese, and insert them in the places from which the others were removed. This, covered up in a close place for a month will, if free from mould before, turn out absolutely ripe, and be of the same flavour as the cheese from which it was inoculated.

THE DAIRY SYSTEMS OF LONDON AND OTHER LARGE TOWNS.

The Dairy systems of this country resolve themselves into three :—Providing supplies of milk for the population of our large towns, which are becoming every year more important and extensive; the making of cheese to suit the various tastes of our population, who may be said to use it almost to a man, in a greater or less degree; and the production of butter, almost as extensively used by the bulk of our population. Of all the large towns in the kingdom, the supply for the population of London is the most important matter; and so great were the secrets of a London establishment deemed, that it was with the greatest difficulty Mr. Youatt, when writing his Treatise on British Cattle, could gain the information he required. Access to the dairies in London was absolutely refused, though in the country he had but to ask to obtain assistance, and even hospitality. Those who take a strong view of the adulterations of milk will attribute this to a dread of exposure; but it may very readily be believed that the joint-stock dairies, which at one time threatened to swamp the trade of the private dealers, might have some reason for wishing to keep their secrets to themselves. Whatever may have been the cause, it must be admitted, that we scarcely know anything respecting the London dairies, but what is furnished by Youatt's authority—we mean that of Mr. Laycock's and Mr. Rhodes's establishments. The number of cows in 1834 he gives at 12,000; but although London has increased since the period when Mr. Youatt wrote, at least one-fourth, we should be surprised if the increase of dairy-cows had been very great,—or if they had even increased at all! The railway system has introduced a completely new mode of supplying our large towns with milk. The very notion of a milk establishment, in a large town at all, has in itself become an anomaly. To drive large herds of cows through crowded streets, to provide them their food, to convey away their manure, and to obtain litter, air, and water,—were no ordinary difficulties. But these were difficulties infinitely short of the transport of milk from a distance. If milk had to travel five or ten miles,—and the least of these distances it must have travelled,—it would have incurred great risk, in summer at least, of being converted into butter when it arrived in the city. The railway system has brought fresh milk from the country in less time, and with less injury, for a distance of twenty miles round London, than was formerly incurred in conveying it from the milkman to the consumer. But the railways have also cheapened the food. The environs of great towns have not now the monopoly of

the sale. Clover and turnips are brought thirty and even forty miles, with much more rapidity, and are much fresher, than formerly, when the distance was only seven; and though they are sold by the pound they are much cheaper, as compared with what they were even ten years ago. The monopoly has been spread over a much greater surface. The somewhat large sum of £82 per cow was given as an estimate of her produce per annum, as obtained by the retail dealer; and the gross sum expended in milk and cream in London at nearly one million sterling. Not a large sum per head for the population, nor a large sum for the wholesale dealers and retailers, when the art, the labour the time, and expenses of food and rent, are taken into consideration.

The milk is sold by the dairymen to the middlemen retailers. These take off the cream, and mix it with water for sale, boil the skim-milk, and sell it warm from the fire. There is no such thing as new milk in London; it is all boiled skim-milk. Mr. Rhodes's establishment, one of the largest in London, stands on an area of about two and a half acres of ground, which has a gentle slope towards the east. The cow-houses are in a line with this slope, and are furnished with drains behind, and a long trough before. In the one their food and water are allowed to run, and down the other their droppings and drainings discharge themselves. The stalls are arranged on each side of the gutter. These stalls are double; two cows being placed in each, and each cow having a manger and a covered water trough let into the wall. The cow-houses are twenty-four feet wide, and eight feet high, lighted with glass, and well ventilated. Of these cow-houses there are four long rows, and at the bottom is a quadrangular yard, surrounded by similar sheds, partly used for feeding the drape cows, and partly for keeping pigs, which feed on the refuse food of the animals. Four or five hundred cows, which are usually kept in the establishment, supply milk, varying with circumstances, and sometimes, of course, beyond the demand. Where this is the case, the milk is skimmed, and being placed in a large souring cistern, is given to the pigs. This, and the grains which may be left after the cows are fed, are almost their exclusive sustenance. Near this quadrangle is the dunghill, after the American fashion; a plan of all others the most desirable in a large town, from being so much excluded from the air, and affording the best opportunities for its innocuous removal. The cows are never loosed, so long as they are milkers. They usually come in from Yorkshire or Durham, often purchased at Barnet fair, and are all newly calved. They are fed mostly on grains and hay. Sometimes, as we said before, clover, and grass, tares and mangel, are

brought from a distance; but the system of feeding on fermented and preserved brewer's grains is more or less general, because they are known to have the most wonderful effect in promoting the secretion of milk. Those of the ale brewer's are preferred to the porter brewers, and they are preserved in a pit sunk in the establishment, lined with brick and cement, trodden down and kept air-tight. An incipient vinous fermentation takes place, which runs into acidity, and the whole mass is soured, the same as the milk for the pigs; but with this difference, that in the one case the air is freely admitted, while in the latter case it is carefully excluded. Here keeping is said to improve the grains; and months, and even years, are permitted to elapse before they are consumed. Of these the cows have about a bushel per day. Hay in winter, and tares and cut-grass in summer, eke out their soured grains, with a daily allowance of salt, keeping them in high condition; and they will give, on an average, nine quarts of milk per day. If they do not give this quantity, or within one quart, they are at once condemned. Mangel wurzel, turnips in small quantities, and even potatoes, are given in winter. The change from the open air to the cow-houses of London is very great. It might be supposed that it would have a ruinous effect on their health and condition. But this is not the case. They are usually confined only for eight or ten months; and this is not long enough to produce much damage. The change in their food, also, is rather favourable than otherwise; and the currying of the skins, which is universally adopted, has a very beneficial tendency in overcoming the want of exercise. The cows, when they cease to be milkers, are generally sold to the distillers, though some dairymen send the best specimens to the bull. The general system, however, is to sell them off; and for this reason the Yorkshire cow is so generally the favourite in the London dairies, because she is of more value for fattening than almost any other, and gives a larger proportion of milk, although it be of a less nourishing and poorer quality.

In the establishment to which we have alluded, and at the end opposite to the pig-houses, is the suit of rooms used for the dairy. Here are three rooms,—a measuring room, where the milk is measured to the retailers; an inner or scalding room, where the vessels are kept and washed, and which is furnished with a boiler and tables; and the inner room, or dairy, for the unsold milk. The retailers usually milk the cows themselves, at four o'clock in the morning, and three in the afternoon. They take the produce of one, two, three, or more cows, according to the demands of their customers; but have their supply

either added to, by the dairyman, from the produce of other milch cows, or they pass over the quantity they do not require, if they have procured more milk than they have demand for. The dairyman makes butter of the surplus milk, and gives the skim milk either to feeding, or more generally to breeding and store pigs, soured as has been described.

THE LIVERPOOL DAIRY SYSTEM

Is different from that of London, because it is more connected with the farming operations around that town, and we cannot select for remark anything so complete in that neighbourhood—if, indeed, anything in the country is half so perfect—as the system of Mr. Littledale, of Lisceard. His dairy, though much smaller than the London one we have named, is carried on with a spirit that rather reminds us of Mr. Harley, at Glasgow, who remodelled the whole dairy system of towns, than anything else with which it can be compared. Mr. Littledale's farm, of 350 acres, is made subservient to this purpose, and his farm buildings were especially erected for the purpose of carrying out the system. They cover about four statute acres. His cattle occupy three cow-houses, or, as he calls them provincially, "shipons," and are arranged in parallel lines, with yards between,—one holding sixteen, another twenty-eight, and another thirty-two cows. From these yards drains run into liquid manure tanks, and the cattle are tied by the head in a stall, after the London fashion. His farm grows mangel wurzel, turnips, potatoes, and green food for his cows, and he also feeds a large number of pigs, as an auxiliary to his dairy. The stalls in the cow-houses are partitioned with blue Welsh flags, connected with iron rods, and each animal is furnished with an iron manger.

A passage before the head of each row of cows, which is single in each cow-house, enables the feeder to supply them with their food without disturbing the animals; and they are never taken from their stalls either for food or exercise. The whole of the cow-houses are laid also with Welsh tiles, and an open drain runs behind the cows, furnished with stench-traps, to convey the liquid to the tanks, by the covered drains from the cow-houses. There is no provision for the conveyance of water; for, being fed so largely on roots, they require but a small quantity, and what they require is carried in pails. In addition to this green food, Mr. Littledale uses a large quantity of grains from the brewery, and gives boiled linseed, as an auxiliary to his roots and green food. His cattle are curried and brushed regu-

larly, and as regularly fed, and though they are, as we said, never loosed from their stalls, they are remarkably sleek and healthy, and free from many of the epidemics which so commonly prevail throughout the dairy county in which he lives—the county of Chester. The ventilation is attended to by means of open-paled weather-boarded ventilators at the top of the cow-houses, by which he is able to regulate the temperature.

The dairy is a very completely arranged building; the floor is laid in cement, and there are two large sycamore tables, one on each side, and one of marble at the end, with three large, but shallow, octagon leaden milk-bowls in the centre. The walls are lined with glazed Staffordshire-ware tiles, and the roof has in it a large ventilator. The walls, which are exposed to the north, are built hollow, having a three-inch apertnre, which communicates with the space between a double ceiling, which covers the building, and thus gives an ample command of low temperature in summer,—a higher one in winter being easily obtained. The milk, when cool, is placed in glass milk-pans, and is brought from the cow-house in sycamore pails, with polished girths. The churn is of the old-fashioned cylindrical form, made so as to be worked by his steam-engine, and will churn eighty gallons of cream at one charge. To make this into butter, under favourable circumstances, it requires but some eight or nine minutes.

Though, as may be supposed, profit is not the entire object of the spirited proprietor, there is no doubt but his proximity to Liverpool renders his produce, both in milk and butter, worth a large sum; and as he grows so great a quantity of green crops, and uses these to produce the paying article—dairy produce,—he is enabled, as a consequence, to grow large quantities of corn.

Somewhat similar to this was Mr. Harley's dairy, near Glasgow; he kept 260 cows, closely tied by the head; kept them by soiling, and showed the milkmen of Glasgow that he could obtain as much milk by *one* acre soiled, to house-kept cows, as five would produce if the cows were allowed to roam at large. If we take into account the quantity soiled with their excrements, and rendered unfit for food, the unequal manner in which they eat the pasture, which allows much to run to straw, while some is eaten so close to the ground as almost to injure the roots, and the quantity trodden down and destroyed by the cattle lying upon it during the night, and contrast this with the cleanliness, the sweetness, the freshness, of such as have food brought to them, we need not wonder at the statement. The preservation of the whole of the liquid manure enables a dressing of that

fertilizing material to be applied to the grass after every cutting, so as to make the most of the productiveness of the soil. A great quantity of this is doubtless saved, which would otherwise volatilize and evaporate.

Perhaps a stronger contrast to the good management of these spirited men cannot be offered than the *adulteration of milk*, unhappily practised in our large towns, and so extensively carried on, that it is doubtful whether some of our population ever taste snch an article as the pure milk of the cow. Allusion has been made to the mixing with water so generally practised, and to the partial or total abstraction of the cream before the milk is sold to the consumers. This of course makes it blue and thin; and the least objectionable and most simple resource to disguise the fraud, is to boil it, to thicken the consistency, and improve the flavour. But far more equivocal modes are adopted. Sometimes sheep's and calves' brains are mixed with it, which render it thick and rich in appearance, and make an apparent rising of cream to the surface; nor is this adulteration easy of detection. Recent statements would, if believed, show that even horse's brains, from the knackers' yards, are sometimes used, as being more easily procured,—the brains of sheep and calves being often sold with the heads.

A very old adulterant of milk is chalk and flour,—so common a few years ago as to obtain for town milk the significant name of "whitening." This mixture preserved the milk for a longer period, thus enabling the adulterator to take off more of the cream. It became thin, however, by standing, and deposited a sediment, and thus was liable to detection. An improvement in this trick is to adulterate with boiled paste and sugar. A permanent thickness and sweetness is thus given, and it is less easy of detection than raw flour, but is recognizable by the test of iodine. Starch has the same effect, but is liable to the same process of detection. The white of eggs is also sometimes made use of to thicken the mass.

A refinement on all these modes is to mix the milk with an emulsion of almonds, and even of hemp-seed. Indeed it is questionable if milk itself is not absolutely manufactured from this and some other ingredients. About fifteen quarts of water may be made to resemble milk for less than a shilling; and if a little milk is added the deception will be complete. Hemp-seed emulsion has very much the same effect, but is more easily detected by its acrid taste; yet this may be removed by a sugar or sugar-candy mixture. Raspael detected both these as thickening matter for skimmed milk in Paris; and the re-

searches of Mr. Berruel showed that the deceptive effect, especially of the almond mixture, was nearly complete.—It would be tedious to repeat all the tests for these adulterations. When they are suspected it will be far the best to carry them to an experienced chemist; and the exposure of the parties in a few instances in the public prints would be far more effectual in arresting the villainous process than any personal manipulation, which would not carry the same weight with the public. As a public duty this ought to be done; for the mischief, as well as the disgusting nature of the practice, should at once be arrested.

PRESERVATION OF MILK.

This is by no means an easy measure. Milk consists of materials so protean in their character, that the attempt at preservation so decomposes or transmutes their qualities, that the mixture ceases to be milk. There are, however, many inducements to preserve this invaluable luxury, if it be possible, even for the purpose of transmission from the interior of the country to the large towns; but this can only be effected by preventing the formation of the lactic acid, or the vinous fermentation of the mass; and by preventing the decomposition of the sensitive casein. We must therefore either confine both these principles—the saccharine and caseous materials—by some strong affinity, or we must exclude air and warmth, to effect our purpose. In Holland the milk is mixed with carbonate of magnesia, which thickens it, and prevents it from souring. This, or some other alkaline mixture, will doubtless preserve it for a short period, especially in winter, by forming a salt with the lactic acid, as it is developed, and by keeping the casein in a state of solution. Fifteen grains of the carbonate in a quart of milk will not give it any very unpleasant taste, and will certainly prevent its acidulation and curdling. Carbonate of soda will have a similar effect; and it is thought by some to improve the tendency of the cream to separate from the milk. Possibly the reason is, that with the soda it can be kept so much longer, and thus give it a better chance of asserting its inferior affinity.

Another plan is to place the new milk in bottles, and insert them in a pan on the fire, immersed in cold water, until the water boils. The air in the bottles thus becomes rarefied, and, if corked up hot, will be kept for a considerable time in a state of comparative freshness, to be used immediately the bottles are opened. The addition of a few grains of carbonate of soda will of course much improve its keeping qualities. It should also after this be kept as cool as possible.

M. Adepert's method is a step beyond this. He recommends the milk to be subjected to a heat so gentle that the great bulk of the purely watery parts will be evaporated; then to be closely corked up. This, of course, has a much stronger tendency to resist decomposition than if the whole of the watery particles remained. If it were boiled in the bottles in which it was to be finally corked up, and this during the hot state, as in the instance above, with a small addition of soda, it might keep in a palatable condition for a considerable period,—not indeed to compete with newly-produced milk, but to be a luxury on board a ship far out at sea, without any fresh supply of that nutritious article.

Duchoff, a Russian chemist, went even beyond Adepert, and his scheme professes to be perfect, furnishing a supply of milk for any length of time, to be used at pleasure. It is by forming essentially a milk powder. He proposes to evaporate, by a slow fire, the whole of the watery matter from the milk, and thus have a solid and pulverulent mass, which may be kept in a small compass in a bottle, and when required be dissolved in a proper quantity of water. Now, as milk contains water in the ratio of nearly nine-tenths of its substance, it may, possibly, be much reduced in compass, and made capable of being preduced extemporaneously at pleasure. This would supply a great desideratum. It is extremely doubtful, however, whether it would preserve the taste of the milk, however much it might retain its nourishing qualities.

THE OPERATION OF MILKING

Is one which has more to do with the success of dairy management than is generally supposed. It must be performed carefully, thoroughly, and kindly. The cow must be educated to give her milk freely, and this can only be accomplished by a system of kind treatment when she is a heifer, and has produced her first calf. Many a cow, physiologically capable of being a good milker, is spoiled at the very outset by unskilful treatment. The new sympathies and sensations of the mother are very decided and very painful. The vessels of the udder are strained and sore, and a rough and brutal treatment of her at this time will stamp her as a vicious cow for ever. She will withhold her milk, become a hard milker, and will thus, by retaining the contents in her udder, meal after meal, soon run off her milk, and become prematurely dry. Nothing can be more utterly injudicious than the mode adopted by too many dairymen, of taking away the calf the moment it is dropped, to prevent the mother from

seeing it till she cannot distinguish it as her own. A greater violence done to common sense cannot be imagined. The udder is distended and painful; and nothing is so calculated to soothe and relieve it, as the mucus covering of the mouth of the offspring; nor will anything be so grateful to the mother, or cause her so readily to give up her milk with ease and facility in milking. At first the teats are gummed up by a glutinous sort of cork; this should be removed with the hand carefully, or by the application of warm water. A little of the beestings should be milked into the hand and rubbed on the teats and udder; and then the calf should be assisted to milk. If the udder be very full and distended, a little milk may be carefully extracted by an experienced milker. If the calf be feeble it may have a few spoonsful given by the spoon; only, however, that it may the more vigorously attack its mother. When the calf is satisfied, the udder should be stripped clean. On the second day it should be placed in a stall near the cow, to attract her attention, and be let out only just before the milking hours, which, in newly-calved cows, should always recur three times a-day at least. This should be practised for a fortnight, as all calves should have new milk for at least that period, and then the hand milking may be altogether substituted. She gets a habit of docility from instinct, and gives her milk with cheerfulness and pleasure; but if with a sore udder, without her calf, and its mental influence as well as its physical upon her, she is left to brood on her unsatisfied instincts, she becomes peevish and sulky. The period of milking, which ought to be one of relief, becomes one of pain and annoyance, and often cruelty; she becomes a confirmed vicious cow, and therefore a hard milker! A young heifer should never be tied at first. So long as the calf suckles, she will not require it; but when tied by the feet she should also have a noose passed over her hams, to prevent her kicking. Three persons should always be sent to milk a young cow, one to her head, one to her hams, and one to milk. If she shows vice, or wildness, or kicks at first, the noose over her hams will be a very efficient remedy. Milking should always be performed the very first thing in the morning. Five o'clock in summer, and six in winter, are the latest periods it should ever be performed. In the evening it may be done at five; and regularity in this respect has more to do with success than is generally imagined. The cows should not be driven home, but the milk should be carried from the field, if distant; for a great waste of milk will take place, if they are driven about. If under cover, it is by no means a bad plan to give them their feed at the time they are milked. It assists to quiet them, and makes them

part with their milk the more freely; and as most milk cows, in winter and spring at least, have mash, it is desirable to give them this during the milking the first thing in the morning.

The most important part, in the operation of milking, is perhaps to *milk clean*—to take out the whole of the milk from the udder. Not only is the last portion the richest in cream and in butter, hut there is not a more certain way of drying a cow than allowing a part of her meal to remain in the udder. It is a good plan, hut too generally neglected, to wash the udder with warm water before milking. Nor is it of less consequence to have a good-tempered and expert milker. A savage ill-tempered milker will often spoil a cow; and, if she once holds up her milk, it is a proof that the milker is defective or disagreeable to the animal, either from her disposition and temper, or in the manipulation of the udder. Pleasant milking is that which sensibly relieves the cow's udder. A free, decided, but gentle grasp of the teats, and a full and vigorous stream of milk, are the marks of a successful milker. It is desirable to rub and stroke the udder when the stream ceases, to encourage the delivery of the slightest remains; nor is it a had plan for the milker, or in large dairies, for the foreman, or even master, to take a small measure and follow the milker to "strip" all the cows. There are some masters who make a point of always attending to this at the milking, and they thus see the character and capabilities of the milker. Women are hy far the most capable of milking; their hands are more gentle and delicate, and the cows seem generally to prefer them.

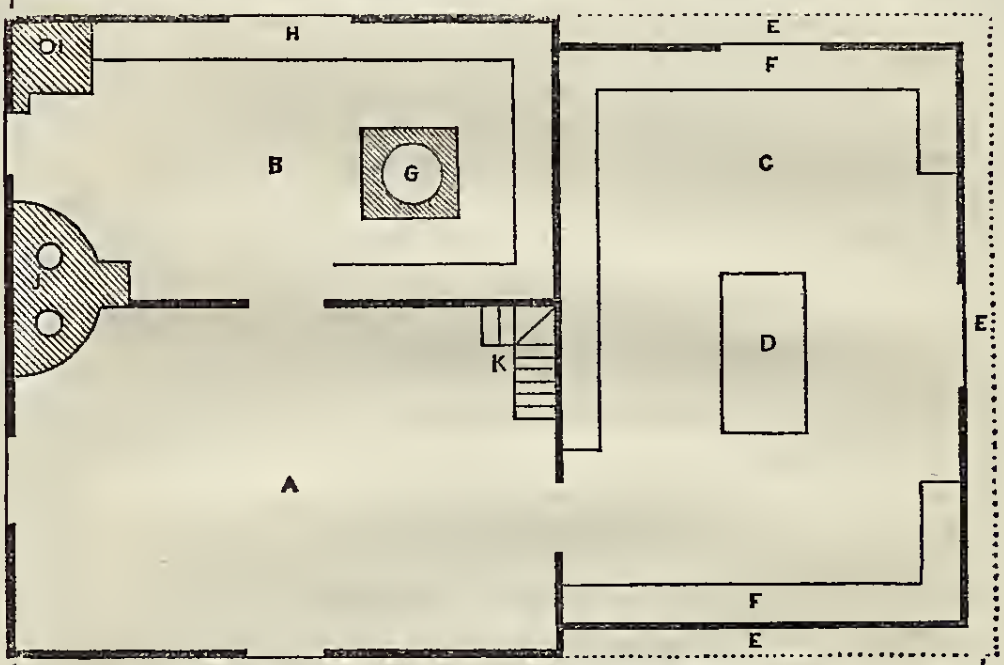
There have been several attempts to accomplish the milking hy other means than manipulation. Some syphons were invented, which were alleged to have the peculiarity of clearing out the udder without the use of the hand. But this has not heen found so successful as to ohtain any wide-spread use; or indeed to he much known, even amongst experienced agriculturists. It is obvious that there are only two modes of overcoming the tension of the udder, likely to effect the purpose. The one is compression, the other is suction. The syphon went on the erroneous principle of distending the mouth of the inner duct of the milk in the teats. This is a disagreeable process, and would subject the cow to a flaccid state of teat, likely to induce her to commit the fault of milking herself.

An American plan, recently mentioned in this country as practised in the United States, is much more feasible. It proceeds on the two principles we have named, and consists of four India rubber bags, which are drawn over the teats, and set so as to he air-tight. At the

lower end of these, metallic tubes, with taps, are inserted. When the adjustment is perfect the taps are turned, and the whole of the milk in the udder is said to be thoroughly exhausted, and in half the time required for hand-milking. It is said that a man can milk ten cows thoroughly in fifteen minutes. It requires, perhaps, more experience than has yet been obtained, before it could be recommended; but the idea is novel, and not altogether void of feasibility.

THE DAIRY.

This may be classed among the most important branches of rural husbandry; and its success depends on various contingencies. The dairy should be kept apart from all household operations, from open grates and from dung-heaps, and should have as much as possible the means of



A	Churning-room.	F	Table for milk bowls.
B	Cheese and scalding-room.	G	Curd pan.
C	Dairy.	H	Tables round.
D	Table.	I	Pump.
E	Verandah.	J	Boilers for scalding.

an equable temperature. As, however, it is much easier to keep a cold building warm, than to cool a hot one, it is desirable that it should be as much as possible shielded from the sun's rays. It should have its side to the north, its end to the east, and, if possible, be let into the earth a few feet, but not so deep as to interfere with the

drainage. If covered by a large tree it would be all the better. Around it should be either a hollow wall, or peat earth should be walled round its exterior; or, as another alternative, and possibly the best but most expensive, it should be surrounded by a verandah. It should also have a double roof, and abundant top and side ventilation —either of which should admit of being closed. It is necessary to have in it a pump, and the floor sloping. On the highest part a perforated pipe should be connected with the pump, to allow of the cleansing of the floor when necessary with cold spring water. The bowls should either be earthen ware or glass dishes, placed upon wooden tables—fir, maple, or sycamore being the best,—or leaden bowls may be used, placed on frames, and surrounding the dairy. Slates are the best for the floors, and a lining for the walls of white pottery is not only elegant but useful. A pipe connected with the boiler attached to the kitchen fire, with a stop-cock, so as to regulate the heat of the room in winter is a great advantage. The scalding and churning rooms should be distinct from the milkhouse, and the latter should be kept as free as possible from all kinds of foreign matter. An outer verandah is useful for drying the dishes and pails, and therefore desirable, when the dairy is sufficiently extensive to render the expense of its erection judicious.

In the sketch on the preceding page we give the plan of a dairy which combines the whole of these advantages.

Following the order already indicated (of first describing the butter-making, and afterwards the cheese, and then reviewing the various systems adopted in the most celebrated dairy districts of the kingdom), we shall enter upon the subject of

THE AYRSHIRE DAIRY SYSTEM.

Ayrshire is a district celebrated in Scotland and in the north—and justly so—for the manufacture of *Dunlop cheese*. These cheeses are from two to four stones in weight; and hence to make one large cheese at a meal requires a dairy of at least fourteen cows. In this case a cheese is made night and morning; but if a smaller dairy is kept, the night's milk is reserved till morning, the cream skimmed off, and both warmed, so as to make the whole mass 90° to 95°. Following the course of the large dairies, however,—those where the cheese is made in the greatest perfection, namely, from new milk as it comes from the cow,—a large cheese-tub is placed in the dairy, and upon this is placed a framework of wood, denominated a ladder. Over the

whole is placed a thin linen strainer, and the milk, if sufficiently warm, viz. at least 85°, is strained through this cloth into the tub. If, however, it should not be of that heat, it is placed in a deep tin or copper vessel, and inserted in a furnace of hot water, until it attains the requisite degree of heat; for all the success of the cheese-making from the rich milk of the Ayrshire cows depends upon this precaution. If the cheese is made from milk of a less heat than this, the curd does not contract properly, and some is wasted in the whey; nor is the cheese so compact; whereas, if it is much hotter than 90°, except in winter, when it cools down considerably in the very operation of making, the cheese will ferment, and the casein run through its various stages of decay.

The next process is that of adding the rennet. This consists of the stomach of calves, at least one year old, steeped in salt and water, in the ratio of three to the gallon; and in the best-managed dairies a lemon is added to take off the bad flavour. This stands for about two months, and is called *yirning*. A tablespoonful of this solution is added to each hundred quarts of milk, and the whole is covered by a woollen cloth to prevent the escape of the heat.

When the curd is sufficiently firm for breaking, usually about a quarter of an hour after the rennet has been added, it is cut in all directions—a knife with three blades being preferred, as expediting the process—so as to have the curd in cubic pieces. It then begins to sink, and as much of the liquor (whey) is taken out as can conveniently be removed in a wooden dish. The cutting of these cubical pieces again commences, slowly and cautiously at first, to break the curd as little as possible, but more rapidly afterwards, until the whole of the pieces are thoroughly divided, and made quite fine. It is then allowed to settle for some fifteen minutes, and the whey again taken from it with the dish, and strained through a fine hair-sieve, to arrest any of the small particles of curd which may be taken up with the whey. The curd is then cut out, and laid in a heap in the tub, to allow the whey still to drain away, but only by the pressure of its own weight; and when all the whey that will leave it has been so expressed, it is placed in the cheese-vats, which were before covered with a cloth. It may remain there for half an hour, under a pressure of about a stone weight, to press out the remaining whey; but leave the fatty or butyraceous particles in the curd. It is then taken out and cut into slices, and again subjected to a greater pressure, and either broken fine by the hand or torn in pieces by a curd-mill, until it becomes almost reduced to crumbs. It then undergoes the salting process,

which generally takes place at the rate of 7½ ounces of salt to the English stone of cheese. A fine linen cheese-cloth is now washed in warm water, wrung, and placed in the chessel, or chessford, and half a hundred weight laid upon it for an hour. This is doubled for another hour, when the cheese is taken out, placed in another cloth, and again put under an increased weight for about three hours. This continues for about four days; every time changing the cloth, and generally turning the cheese upside down; and the weight is increased until the cheese arrives at a degree of consistency to bear the pressure of a ton.

When taken out of the press the cheeses are placed in a very dry and rather warm atmosphere, often within the range of the influence of the kitchen-fire, turned several times a-day, and rubbed with a dry cloth. This continues for a week or ten days, when they are removed to the cheese-room, where they are exposed to a cool dry atmosphere; a gradual mode of ripening being, at this stage, necessary to their proper condition. The Dunlop cheese is seldom coloured, though some herein imitate the Gloucester and Cheshire fashion. The peculiarity of management is that of making the cheese from the milk from the cow before it cools.

THE CHESHIRE DAIRY SYSTEM.

The Cheshire cheese is as celebrated in England as the Dunlop is in Scotland, and it has long received the greatest attention from the Cheshire dairymen. The evening's milk is set up until the morning, when the cheese is generally made, and the cream taken off. The skim-milk is scalded to about 100°; and one half of it, mixed with the new milk from the cows of the same morning, is strained through a fine hair or gauze sieve, while the remaining half is mixed with the cream, which is also added; so that the whole mass is about 83° to 85°; the annatto being added to the mixture in the proportion necessary to give the colour aimed at in that particular dairy. Two ponnds of annatto is generally considered sufficient to colour a ton of cheese. The rennet is prepared exactly in the mode described in speaking of the Dunlop cheese, and added in about the same proportion. The tub is then covered with a wooden cover, and a cloth placed over it to keep in the heat. It remains about an hour in this condition. The curd is then gently but thoroughly cut with a cheese-knife until it is divided into small pieces, and is again left covered for an hour to settle. The whey is then taken out by a pan or dish; the dish being pressed gently on the curd, to gather up the whey. The

curd is laid on a heap in the tub, and gently pressed. As more and more of the whey separates, the curd may sustain the greater amount of pressure without fear of forcing out the fatty matter. A perforated board is placed over the curd in the tub, and a weight, of from twenty to twenty-five pounds, placed upon it, and again the whey is baled out. It is then turned, and the same board, with a greater weight, placed upon it. It is then cut into square pieces, and pressed once or twice, when it is fit for the vat or chessford, which has in it a coarse cloth. Before being put in, the curd is broken into smaller pieces and salted, then piled up in the chessford, and covered with the cloth by having its edges turned over it. As soon as the curd adheres, a cover is placed on the chessford, and the whole is pressed by a thirty pound weight. The curd is then punctured on all sides with skewers to admit of the free escape of the whey. It is taken out, cut in slices, and again subjected to more pressure, and more punctures by the skewers. The pressure is again increased, and the cheese frequently turned and the edges pared; the parings being placed on the top of the cheese, and pressed into the centre. A pressure of sixteen hundred weight is now given, the cloth changed, and the cheese turned several times in forty-eight hours; then taken out, and immersed in or covered with salt. It is sometimes salted by washing it with salt brine, and is, when taken out of the chessford, placed in a cylinder or hoop of proper dimensions, when it is washed in warm water, dried with a cloth, and placed on a shelf to dry, where it is allowed to remain a week. It is afterwards washed and dried again, and anointed with fresh butter. It is placed in a somewhat warm situation, and rubbed every day, for one week more, with butter, which much improves its character, and, above all, its appearance.

The writer has been favoured by the Rev. Robert Pulleine with the following account of an improved mode of making Cheshire cheese:—

The cream is taken off the evening's milk, and the milk is added to the morning's. The cream is then slowly stirred into it. If below 75°, a portion of milk is heated in a tin, put into a copper of boiling water, and added to the milk to raise it to that heat. The rennet and colouring liquid, annatto, is then added, and the whole covered over and allowed to stand until the milk is creamed, when the curd is ready to be broken, which is known by its leaving the knife clean. It is cut into small squares slowly, then slowly turned over in the tub with the hands; after that churned with a wire to break it still smaller; again very slowly turned with the hands; then turned again with a board. The whey is then taken from it, a weight

being put upon a loose wooden top that covers about half the tub. The whey is carried at once to a larger boiler, where the whey is all taken out; the curd is put into a cheese-cloth, and then into the vat; circles of tin being put to hold it up, and a weight of about 28 lb. on the top. It is allowed to drain about ten minutes, and then turned over, and again allowed to drain. After that, it is taken out of the vat, cut up again, and broken with the hand, and then replaced in the vat; salt being sprinkled upon it all the time. The vat and all the cloths are scalded, and used warm. A weight is again placed upon the top of a board, which covers the whole, and it stands until the following month, when it is put into the press, where it remains—being changed two or three times a-day—for four days. It is then taken out and bound up. The whey is scalded, and a portion of the whey from the day before is added. The flutings are skimmed off—the first for butter, the second for servants' breakfast, the third for calves. The whey is then mixed with chopped hay for pigs. A skewer is put into the cheese to let out any whey. To make the corners round, the cheese-vat is heated. After being taken from the vat, it is bound round with cheese-filleting, and taken to the drying-room.

WHEY BUTTER

Is a product of new milk dairies, and in Cheshire is a branch of dairy manufacture. It was stated, that though much of the fatty matter of the milk remained in the curd, yet some necessarily escaped into the whey. It is already developed, but in a state of feeble union with the whey, and requires a churning process before it can be collected.

Mr. White, in his "Essay on the Making of Cheshire Cheese"—a very elaborate and pains-taking document—states that one hundred gallons of milk, made into cheese, will give ninety gallons of whey. This will yield twelve gallons of fatty, creamy matter, which, when churned, will give some four pounds of butter. The mode of treating the whey is to heat it to about 180°. Afterwards it must be well stirred to prevent it "setting on." At this stage some sour buttermilk is added, and occasionally some white whey, in the proportion of about 1 to 1·70 of the former, and one-tenth of the latter. This causes the butyraceous matter to rise to the surface of the pan, when it is skimmed off and placed in an earthenware jar, to take exactly the course of fresh cream—to form lactic acid, and separate the casein from the mass. The remainder of the whey is then allowed to run off from the oily matter, which swims on the surface, and this is churned the same as the ordinary cream. The whey butter is an inferior kind,

worth about 20 per cent. less than milk butter, and is mainly used for pastry purposes.

THE LEICESTERSHIRE DAIRY SYSTEM.

This fertile county, partly grazing, and partly dairy, is a mixture of arable and grass land; and the pastures being, on the whole, rich, and the land productive, a large portion is grazed by cattle. On some farms, however, the dairy is the principal object, and the land enables them to produce a cheese perhaps unequalled in richness. We have hitherto only had our attention directed to new or whole-milk cheese; but a step beyond this may be gained. If some of the skim-milk be rejected, and the cream added to the new milk, we have a still richer cheese—the product for which the north-eastern parts of Leicestershire are famous; we mean the far-famed *Stilton Cheese*. This cheese differs from the Dunlop as regards shape, and from the Cheshire both in shape and bulk. The latter may be from half a hundred to two hundred weight, though perhaps the former is nearer the mark; but the Stilton seldom weighs more than from twelve to fourteen pounds, and is the shape of a round hat without the brim. They are generally made by adding to the new milk of the morning the cream of the milk given on the previous evening. If a richer cheese is required, more cream is added, and even butter is sometimes said to be added to enhance the peculiar richness of the Stilton cheese. The temperature should be about the same as for the Cheshire, 85°; and this is attained, when necessary, by inserting jugs of hot water in the mixture. The rennet is added without any colouring matter, and in an hour the curd is fully formed. Great care is necessary in removing the curd. If handled roughly, or squeezed at all, the cheese is seriously injured. It is usually gathered carefully off the whey by a wooden dish, and placed upon a linen strainer, which is tied together at the corners, after the manner of making cheese-cake curd; and the whey gently strains off by the pressure of its own weight alone, into a vessel beneath, which receives it. A little squeezing with the hand, or with laths, is then given, and the whole is allowed to drain six or eight hours in moderately warm weather. It is then placed in a cylinder of copper, zinc, or tin, which has numerous perforations at the sides, being first secured in an open or coarse strainer; gently cut in slices from the first strainer with a sharp knife. In this hoop it remains for four or five days, being turned every day once or twice, and punctured with skewers through the holes of the cylinder after the manner of the Cheshire. Warmth is requisite to the ripening of this description of cheese.

When the curd has become solid, the cheese is removed from the cylinder, and bound up in canvas bandages, or rollers, which encircle it several times. These are clean and dry; all cracks are gradually filled up, and fresh binders supplied every morning for a week or two, until the much-prized skin is formed; after which they are removed to the drying-place or chamber. It is two years, however, before a Stilton cheese is at full maturity, except when its ripening is hastened by the method of inoculation described at the commencement of this chapter.

THE GLOUCESTERSHIRE DAIRY SYSTEM.

In this district, celebrated for its *double Gloucester* cheese, the practice is not so entirely dissimilar to the Dunlop and Cheshire modes as to require a very minute detail. They weigh usually about twenty-two pounds each, and are a rich and useful cheese. The single Gloucester, or one half new milk and one half blue, or skimmed, are disappearing from public approbation. The milk fresh from the cows is taken and mixed at once with the rennet and annatto, and left for an hour covered up to prevent the escape of the heat, which is maintained, so far as it can be, at the same degree as in Cheshire; and the curd is broken by a knife with three blades, or a sieve made of wire. The whey is taken out with a wooden dish, and is placed in the vat, over which a linen cloth is spread. Into this cloth the curd is put, and pressed with the hands until it will bear the cover of the vat, which is then placed upon it, and loaded with a weight, or it is placed in the cheese-press. The curd is then torn in pieces by a curd-mill, and again placed with a clean cloth in the vat, and pressed. In four or five days the curd is thoroughly deprived of the whey, and is taken out to undergo the process of drying. It may be observed that salting has not been described. No salt is mixed with the curd, but it is rubbed upon the exterior of the cheese, some twelve to twenty hours after it has been put in the press. It is rubbed in with the hand, so long as the curd appears to absorb it; and the cheese is again transferred to the press. This takes place three times each day, and the quantity of salt, allowing for waste, which a cheese of twenty-two pounds will absorb, will be about ten ounces. When taken from the cloth, they are wiped and laid to dry in the ordinary manner; at the same time being frequently turned. When intended for sale in London, they are scraped and painted. A coat of red colouring matter, dissolved in ale, is used, which is rubbed on the cheese with flannel. Of course this has no beneficial tendency.

THE DEVONSHIRE DAIRY SYSTEM.

This is peculiar, especially as regards the manufacture of *butter*. It is said that the process adopted there is one productive of more butter, and that of a better quality and more agreeable flavour, than any other. The cream, before churning, undergoes the process of *clotting*, or *clouting*, and the *clouted cream* is thus procured. As soon as the milking and skimming processes are over, the warm new milk is placed in a brass pan, sufficiently capacious to hold the meal. A small quantity of cold water is placed in the pan, and here it stands in the daytime for six hours, or at night till the following morning. It is then carefully placed near a slow charcoal or coke fire, so as to be heated to a certain point, but not permitted to boil. It is a delicate matter to have a fire just brisk enough to prevent the milk from curdling in summer, and still not so hot as to cause it to heave or boil. A firm consistency on the surface, and a tough consolidated appearance, are the criterions usually depended upon for the proper amount of heat.

When sufficiently scalded, the pan and its contents are removed to a cold place in summer, and covered over, until cool, with a woollen cloth in winter, when the cream is taken off. The churning may then either be performed at once, or delayed a day or two; but no souring is necessary in this clouted cream—a reason why the butter may be considered more palatable to some tastes. The process of churning is very simple: the cream is placed in wooden bowls, which are alternately scalded with hot, and washed with cold water—a process which, by evaporation, is said to cool them beyond anything else in which the cream can be placed. It is then briskly stirred by the hand, or by a "whisk" of peeled willows, until the buttermilk separates from the butter, which is usually effected in some ten minutes. The buttermilk being poured off, the butter is washed with fresh water, a little salt added, and the butter repeatedly beaten either by the hand or with a wooden trencher or spatula. It is then formed into small cakes, and impressed with either the peculiar device of the dairy, or some fanciful emblem, and is ready for the market.

THE YORKSHIRE DAIRY SYSTEM.

The dairy husbandry of Yorkshire is a combination of the ordinary operations of some four distinct classes of dairy-farming. The one is the making of butter in rolls, stones, or firkins, for the manufacturing

districts of the West of England, and is often combined with the making of *skim-milk cheese*, or "whenby," as it is provincially called. The other is the making of new milk cheese, practised in *Wensleydale*, and to a small extent in *Cleveland*. These two latter modes we shall not describe, as they are not materially different from that of other districts. The last is the making of cream-cheese, which is mainly confined to the valleys of the west, though known as *York cream-cheese*.

The arable land having for many years past encroached on the dairies, by the breaking up of the grass land, the *Yorkshire butter* is usually made from dairies of from six to fifteen cows. In summer, the milk, after straining, is placed in a large brass "kettle," or cooler, and often stirred, to dissipate the foam, and prevent the setting of the cream. In winter this process is unnecessary, and it is at once strained into leaden bowls, in which it is usually kept; a little hot water being added to the milk in winter, to evaporate the aroma of any roots the animal may have eaten, and in summer a little cold water is added, which is said to facilitate the separation of the cream. In winter it remains twenty-four hours in the bowls; in summer twelve, and even less; for the dairywoman watches the milk with the assiduity of a hay-maker in a showery hay-time; and on the least advance of heat, or tendency to thunder, she separates the milk from the cream. The bowl contains a plug in the bottom. This is taken out, and the milk runs off; the plug being returned to arrest the flow of the cream. The cream is then also let off into an earthen vessel, or pancheon; and the leaden bowl, being nicely scraped with a thin piece of horn, is carefully washed and scalded, and is ready, when cool, for the next meal of milk. The cream is kept in these earthen jars or vessels, and frequently stirred; and in winter placed before the fire all night, to acquire the fermentation necessary to an easy and rapid churning. If the cattle have had turnips, a little saltpetre is added to the cream; and if there is no recently-calved cow amongst the dairy herd, a little rolled annatto, or, what is better, an infusion of grated carrots is added, to give the butter the colour requisite for the taste of the markets. The cream is then strained again into a clean and well-scalded churn, which is turned gently at first, and frequently vented, to allow the escape of the air accumulated by the churning. When this escape ceases, it is turned briskly round, and if all is right will be churned in twenty minutes. If the process is slow in winter, a little hot water is added, the sign of the formation of butter being the watery sound in the churn, and a semi-curdled appearance on the vent-cork, called "shill." As soon as the cream is

in shill, the churn is turned much more carefully round, and the butter begins to collect. As this goes on, a little of the buttermilk is let off; and the butter, when finally collected and freed from all the remaining buttermilk, is placed with cold water into the butter trough, being washed and kneaded several times in fresh supplies of cold spring water. It is then salted, and either worked into pounds, which usually consist of about twenty-four ounce rolls, or is rolled up into lumps of fourteen pounds, called "store butter." In other cases it is put away in wooden casks, called firkins, usually a mode in which it is preserved till the winter, and then made up into pounds, by being washed in milk and resalted. In this state it is sold to their customers by the huxters, who think a little rancidity is not too great a penalty to pay for escaping the taste of turnips, so common in winter-made butter.

BLUE MILK CHEESE.

This cheese is made in the great butter dairies, and is a sort of accompaniment to the combined dairy system of Yorkshire. The milk, while sweet—which is one reason why the dairywoman must be stirring in summer by three or four o'clock in the morning—is placed in a kettle; the rennet is then added, with the annatto colouring, and the whole mass heated to something like blood-heat; the hand being the general test of its extent, and perhaps 90° being the nearest approximation. When the curd is formed, it is laved out with a dish into the butter-trough, and the whey allowed to drip from it through a hole in the bottom. When all the whey has escaped, it is either broken very small by the hand, or placed in a curd-mill. Having little of the butyraceous matter present in whole or new milk cheeses, there is less fear of manipulating the skim-milk curd than there is in the cases of Dunlop and Stilton. A cloth is then spread over a chessford, which being put in a press is turned every night and morning, till the whole of the whey is expressed; the cloth being changed every turning. It is then put away to dry and ripen. It was once a favourite commodity for a morning or evening meal, for the farm-servants, with bread and milk. They now, however, dislike and despise it, and have oftener animal food three times per day than anything else. It is used with bread and ale, for their "drinkings" in harvest.

THE YORK CREAM CHEESES

Are not, as the name would purport them to be, made at York; but are chiefly produced in the poorer valleys at the western extremity of the

county. The village of Gruelthorpe has the envied celebrity of making the best cream cheese,—a great trade with London, and all parts of the kingdom, being carried on by the inhabitants of this locality. The process is simple, and depends, like almost all other dairy practices, on the most scrupulous regard to cleanliness, and perfect freedom from the taint of all kinds of putrefaction. There are two kinds of cream cheeses; one is made by simply placing the cream in an oblong tin case, perforated with holes, from which the milk and watery portions of the cream leave the thick cream, to which a little hand-pressure is applied. But much of the cream cheese is made of the cream coagulated by the "yirning," in the following manner:—Five quarts of the strippings (the last milk given by the cow) are put in a pan, with two spoonfuls of rennet. The curd, when formed by gentle heat, is broken down two or three times with a dish. It is then allowed to stand on a sieve, covered with a clean napkin, for about two hours, when a little pressure is applied by the hand, or by a fluted piece of wood,—and it is ready for use in three weeks.

THE WILTSHIRE DAIRY SYSTEM.

This will close our description of the English modes of dairy management. It would not have been introduced, even thus cursorily, had it not been the district which supplies the celebrated *Cheddar cheese.* Although the Cheddar valley is really in an adjoining county, yet the greatest part of the cheese known by that name, and sold in London, is made in Wiltshire. These conical-shaped cheeses very slightly differ from the Dunlop in their actual make. The smallness of their size enables the dairyman to make a cheese for every meal of milk; and also prevents the necessity for so much pressure as is used in some other kinds, by which a great quantity of the butter is crushed out. This enables the dairyman to churn the whey for butter, of which mention has been made in the earlier part of this treatise. The only severe manipulation is the breaking of the curd, which is performed in a very minute degree. This enables the dairyman to allow a great portion of the whey to drain off, with no other compression than is given by its own weight; the curd being disposed in a conical form, in which position it remains about twenty-four hours. It is then suspended in an open coarse cloth, or even a net, to admit air freely, and is so small in dimensions, and especially in diameter, that the whey is dried up by evaporation before it becomes rancid, or spoils the cheese. The freshness of the milk has also a favourable tendency in this particular. The salt is added to the curd.

FOREIGN DAIRY MANAGEMENT.

Climate, as well as breeds of cattle and pasturage, has some influence on the production of cheese and butter; and though few countries can vie with our own in the excellency of its general dairy productions, still, in some respects, foreigners are our superiors. Take, as an instance,

THE DAIRY SYSTEM OF ITALY,

Especially in the manufacture of *Parmesan cheese;*—which, though partly a skim-milk cheese, is almost equal to some of our very best bome productions from milk; it is also in great demand by the epicures of our large cities. From the great size of the cheese, containing sometimes as much as two hundred weight, they often require eighty or ninety cows in a dairy to make them to perfection. Half of the milk is kept one meal, or twelve hours, and then skimmed; the other half a meal, or six hours, and also skimmed. They are then put together in a pan, and heated to a greater heat than English skim-milk cheese,—sometimes as high as 120° Fahrenheit. After it has a little cooled, the rennet is added, and the curd being formed, tbe mass is again heated to a still greater heat (140°), taking care to stir the mess rapidly during the heating. This breaks the curd into small pieces, and saves the curd-mill, to which it is said so much of the toughness of the English skim-milk cheese is due. The whey is run off, and the curd coloured slightly with saffron. The mass has then cold water added, to cause it to coagulate and set. It is then collected from the whey with a cloth, and placed in a fixed press. The next day the cheese (for so it must now be called) is taken out and rubbed on one side with salt, and again subjected to pressure. This rubbing with salt is repeated on tbe other side, when the cheese is again turned, and the process of turning and salting, with the pressure, is continued for forty days. For preservation, the surface of the cheese is rubbed with linseed oil, and a red ochery coat is given to one side. When the cheese is fit for sale, this favourite production fetches a large price.

Mascarponi cheese is also an Italian production, and partly resembles our cream cheeses; but it is made rather after tbe Devonsbire than the Yorkshire mode. The cream is heated nearly up to tbe boiling point; and, when the butyraceous matter begins to separate, a little sour whey is added to the mass, which forms a sort of curd; this is taken out and placed in moulds,—having perforated bottoms, tbrough which the whey escapes,—to take such shapes as fancy or custom may dictate; and, when come to a proper consistence, they

are deposited in napkins, covered with straw or leaves, and pressed gently with the hand. Sometimes tartaric acid is used instead of the fermented whey, which, occasionally containing particles of putrid casein, is apt to give a rancid taste to the cheese, and diminish its keeping qualities. The kind of acid is not material.

THE DAIRY SYSTEM OF SWITZERLAND.

The Swiss butter has the remarkable peculiarity of keeping for ten or eleven months perfectly sweet, without any admixture of salt. Some attribute this to extra diligence and care on the part of the dairy people, in expressing the buttermilk, and to the peculiar mode of preservation adopted; but in all probability it is due to the cool and highly rarified air of the mountain districts, which are the most favourable for its preservation. The butter is made every day, so that no decomposing putrescence takes place in the cream. When made, it is washed with the greatest care, and a great deal of kneading and compression in the pure spring water of the district takes place. It is then deposited in the following extraordinary manner. A narrow board is fixed across the dairy, like a kind of shelf, but in the part where it is most exposed to a free current of air. To the surface of this are attached a row of wooden spikes, some two or three feet long. As the butter is made, it is plastered to the top of one of these spikes; and so the deposit of butter continues to accumulate every day till the whole is covered, and each deposit of butter is dried and preserved as it is placed on the pin, but more upwards than downwards, until it forms a sort of inverted cone; the top overhanging the base to permit the more facile dripping of the moisture. In a short time a hard air-tight covering envelopes the mass, and renders it so impervious to air that it will be found perfectly fresh for several months.

The *boiled butter* is another mode of preserving the produce of the Swiss mountain sides, and is thus manufactured:—A quantity of thirty or forty pounds of butter is placed in a large copper, over a very slow fire, until the whole is gently melted. This slow fire is continued until the whole comes to the boiling point, generally in about two hours,—careful stirring at intervals taking place during the whole period. The boiling must be gradually and gently kept up for the same period as it took to arrive at the boiling point, and the stirring still continued. After this it is allowed to cool slowly, which process may occupy about two hours more. The deposited mass of caseous matter, coagulated by the heat, then takes place; and the butter,

while just warm enough to pour, is carefully taken off the cheesy mass, and corked up in air-tight jars, when it may be kept sweet, though of course without the flavour of fresh butter, for any number of years. Our climate may, perhaps, be unfavourable to this process, as it is by no means a common one, except where there is thin cold air, and possibly water strongly impregnated with alkalies, which take up the lactic acid of the putrefying cream.

THE HOLSTEIN DAIRY SYSTEM

Is one which turns out very celebrated hutter; and this is only due to the simple fact that, being itself so important a production as to be worthy of attention as a manufacture, all its details are managed with attention and skill, and consequently well done. This can never be the case when it is combined with the perplexities of arable farming. The dairies in Holstein vary from 100 to 1000 cows, and the establishment consists of a distinct suite of dairy apartments. In some of the best dairies the milk-dishes are placed in a raised brick ledge, forming a sort of open drain, and in hot weather cold spring water is pumped into them, so as to give artificial coolness to the milk in the pans. Sometimes even a large piece of ice is introduced into the dairy, and even into the churn, to lower the temperature when the heat is excessive. Milking is performed earlier in the morning than common. Three o'clock, and even two, are hours at which they are occasionally stirring. The milking takes place at four, and in general five in the afternoon. The milk is placed in vessels of wood, zinc, lead, glass, or sometimes of various materials lined with china or delf. Of course, when the ledges just spoken of are in use, the glass or zinc vessels are adopted, as wood is too slow a conductor of heat to admit of the carry-out of the water-cooling process. The churning and attendance are the same as in every well-managed dairy; but the making of the butter is peculiar. It is never washed at all, a process which is said in Holstein to injure the butter. It is salted ahout $1\frac{1}{8}$ lb. of salt to the stone of butter, and subjected to a good deal of pressure, kneading, and beating, by heing lifted up and thrown down again into the trough. It is then allowed to soak or drip for several hours, when it is again subjected to the same treatment. When a sufficient quantity of butter is made to fill one of the casks or firkins,—of which there are three sizes made, one containing about a hundred weight, another about ten stones, and the third two hundred weight,—it is re-kneaded and packed in a salt-seasoned cask; care being taken to make the cask perfectly air-tight. Skim-milk cheese is also made exactly in the

mode in which it is made in England, only on a scale considerably greater.

This brief sketch comprises all that we need say on the leading dairy systems; and in the course of it the peculiar principles which ought to guide the dairyman, in improving his system, have been pretty clearly developed. The large establishment of the dairy husbandman, and the small product of the cottier, require to be directed by the same great essential principles of dairy management; strict attention to the health and comfort of the animals, careful milking, perfect cleanliness in the dairy itself, and closely watching the proper time and weather for the various operations.

COTTAGE AND SUBURBAN DAIRIES.

Although an attempt has been made, in the progress of this treatise, to describe, step by step, the details of dairy management and cattle keeping, and to elucidate the best principles of management, yet it may be considered desirable to afford to the cottager and the amateur, who may have a limited area of land, the means of making the most of their resources. The latter has usually two or three acres of grass, the former somewhat less of arable land; and there are modes of management which will enable them both, with proper care and labour spent upon it, to produce double the quantity as compared to ordinarily farmed land.

The *capabilities of arable land* for growing green crops are almost unlimited; and it is scarcely possible to over-rate the productiveness of a small area of land, when carefully farmed. Feargus O'Connor, in reference to his land regeneration scheme, gave an estimate of the gross produce of three acres at £95 10s., the expenditure being £51 10s.; thus showing a profit per annum for the labour of the man and his family, beyond their keep, of £44. He committed, however, two great errors. He forgot the casualties of crops, and pre-supposed land on which a vast amount of labour and capital had been previously expended. But Mr. Dumbrell, of Eastbourne, a cottage occupier of three and a half acres of pasture, and two and a half acres of arable land, found the produce to be worth £40 4s. for the summer half year; thus leaving, after paying all outgoings, a clear profit of £23 11s. 6d. The remaining six months would be less profitable; but he could not, in that year, make less than £30 profit by this small quantity of land. Mr. O'Connor proposed that one acre and three roods should grow potatoes, one acre wheat; three-and-a-half roods to be cropped with green crops, and half a rood kitchen-garden.

From this he estimated a produce of fifteen tons of potatoes per acre, and 200 stones of wheat. The produce of the cows he estimated at £36 10s.; the pigs, £20; the wheat, £7 10s.; the potatoes, £14; the flax, of which he allowed a rood, £12 10s.; and fruit and vegetables he estimated at £5; making the above extraordinary produce of £95 10s. Passing over all estimates, however, Dumbrell made from his cows, from the 16th of January, 1840, to the 27th of July in the same year:—

	£	s.	d.
278 lbs. of butter, at 1s. per lb.	13	18	0
The skim milk, sold for three pints a penny, or given to the pigs, estimated for the year at	10	0	0
Two calves, sold for	5	18	0
The crops being examined by a competent judge, his estimate was nineteen bushels on the half acre and eight roods, at the then price of 8s. per bushel	7	12	0
And on the one rood of land growing oats, he estimated fourteen bushels, at the then price of 4s. per bushel	2	16	0
Making a gross produce of three-and-a-half acres of pasture, and two acres of arable land	£40	4	0

The out-goings from the land were:—

	£	s.	d.	£	s.	d.
Rent, taxes, and tithes	12	12	6			
Seed	2	0	0			
Hired labour	2	0	0			
				16	12	6
Leaving clear profit, for little more than six months				£23	11	6

The *quantity* of arable land necessary to the keep of a cow all the year round, will necessarily depend upon its *quality;* but if useful land it may be taken at one statute acre and a half. If not in condition it will require deep trenching; if light land, claying and well manuring; but once in a good fertile state it may be readily kept so, requiring only a very small amount of extraneous food to be given to the cattle. The cropping that should be adopted, to attain the largest amount of food, is, first to sow the land with rye, clover, winter tares, and Italian ryegrass. In favourable localities the rye will be fit to cut in February. It is supposed that all the crops are to be soiled;

that is, consumed in the stall. As soon as the rye is off, the land must be digged and planted with potatoes, cabbages being inserted between the rows, and beans planted between the potatoes. The Italian ryegrass is next soiled, and after each cutting the land must be well saturated with liquid manure brought from the cow-house. When this is once cut down, the winter tares may be eaten off, and the land dug for turnips, Swedes for the spring, and white Norfolk for the winter; or, if near the sea, mangel wurzel will be the most advisable crop. The clover and Italian ryegrass will then alternate with each other, taking care that the latter is always dressed with liquid manure; for it has not the same effect on the clover. The bean straw may be chopped, and the beans crushed; and thus a great amount of green food, both large in quantity and valuable in quality, will be afforded all the year round.

Where the amateur has *grass land* only, it will be necessary to set apart a portion for meadow, and the rest for soiling. The latter should have a dressing prepared of wood scrapings, clay, and decayed vegetable matter, applied in February, with a pretty liberal hand; the whole of this compost being well saturated, under cover, with liquid manure. In addition, there should be applied two hundred-weight of guano per acre, and either along with it, or soon after, there should be brushed in, half a peck per acre of Italian ryegrass seed. When ready for cutting, this should be mixed with hay, a mixture of boiled ground linseed, and bean or barley meal poured upon it, in the proportion of one pound of the former, and two pounds of the latter to the gallon; the grass, after every cutting, to be dressed with the liquid manure. Three, and in favourable years four, cuttings may be easily made. When the hay has been mown and made in the lap-cock fashion, the land should have a dressing of liquid manure, and the fog soiled the same as the grass. When the season is unfavourable, or the grass deficient, the linseed compound may be resorted to. In winter, cut hay, given with linseed compound, varied by occasional meals of brewers' grains, will be found invaluable substitutes. Green food may then be given from March till November, and hay for the rest of the period mixed with linseed compound, in which case roots so difficult to obtain by the suburban amateur may be dispensed with altogether.

The *cow-house* should be as airy as possible, and if with weather-boarding facing the south and west, so much the better. The floor may be boarded or flagged, with a slope from the head of the animal to the tail, a channel behind, and a drain into a tank, of the capacity

of one hundred gallons per cow, well coated inside with Roman cement. The whole should be kept white washed and perfectly clean, and free from all disagreeable smells. Where the floor is boarded, the litter, so often difficult to obtain, may be dispensed with; but if the floor is flagged with stone, or indeed in any case, it is desirable to litter the cow with an ample supply of *saw-dust*. The fragrant freshness of the wood, the soft bed it makes, the absorbent character of the material, and, above all, the facility it affords as a vehicle for conveying away the solid manure, render it exceedingly valuable as a litter for cows. Moreover it is as easily obtained as it is almost invariably overlooked. The cows should be regularly fed and well curried, and, if possible, turned out daily in fine weather, for two hours per day, for open-air exercise. The cottager, at the expense of very little labour and ingenuity, may construct for himself a very excellent cow-house of whins and thatch.

The *dairy* should be quite apart from the house; and however small its dimensions it should be strictly kept for dairy purposes. No cooking, nor decayed meat, nor any offensive processes, should be allowed within its precincts, but only such as are connected with the management of the milk. It should face the north, and admit of free ventilation. It ought to be a little sunk in the ground, with a sloping floor, and have a pipe carried into it in connection with the pump, and also a drain running out. In hot weather the water from the pump should be allowed to trickle on the floor. At any rate, daily washing should be scrupulously attended to. *Glass milk-pans* are neat and elegant vehicles for holding the milk, and easily removed. Any want of cleanliness in them is readily detected. The amateur should also have a pipe from the boiler of the kitchen fire, into which, at pleasure, he can allow the hot water to flow. This pipe should be carried under the table on which the milk-pans are placed; and in the severe frosts of winter it will be useful in keeping up the requisite temperature.

The *dairy operations* of the small cow-keeper, whether for livelihood or pleasure, are necessarily on a small scale, and do not admit of many appliances. Attention to cleanliness is, above all things, requisite. The main points are the thorough *scalding* of the milk-pans, the pails, and the whole of the dairy utensils; the proper cooling and stirring of the milk in summer, when first brought into the dairy, until the whole of the foam generated in milking has subsided; the careful "siling" or straining of the milk through a gauze or wire sieve; and the creaming of the milk before it is allowed to turn sour in the

slightest degree. The cream, when collected, must be frequently stirred, especially in summer, and in winter warmed before the fire all night previous to the operation of *churning*. This, for small cow-keepers, may be performed either with the ordinary stand-churn, or with the American churn, now common in most parts of the country, and which is very suitable for churning small quantities of butter.

It is needless to recapitulate the directions as to the *management of cream and butter*, because there is no difference between the mode of regulation required for a dairy with one cow or with twenty. Care, attention, early rising, good ventilation, and cleanliness, even to fastidiousness, are the cardinal virtues of dairy management.

CHAPTER VI.

FEEDING OF DAIRY COWS AND REARING OF CALVES.

The main points in the controversy, as to whether dairy cows should in summer be house-fed on cut grass or pasture-fed, have been already partly considered. But it is still an unsettled question, because the advocates of one system are unwilling to concede to the other. The truth is that each system has its peculiar advantages in peculiar situations. The elements of cost of land and labour, of nearness to and distance from a large town, of the nature of the grass or herbage, of the conveniences of the occupier, and fifty other considerations, will make the scale of profit preponderate one way or the other. In large towns, for instance, where land is dear and at a distance from the dairy, it is found to be more economical to cart the materials of food to the cattle. For small cottiers also, who have but a small quantity of land (and this perhaps dear, and their labour of little value), soiling or summer feeding in the house will be abundantly preferable. But in the majority of strictly dairy farms, where there is a large range of poor pasture, the grass of which would hardly repay the cost of cutting and carting, there can be no question whatever that there must be a complete revolution in the nature of the occupation, and of the character of the soil itself, before any change can ever be expected to take place.

It is a very important question, however, whether the *two systems* may not be *combined* with profit. We mean that, instead of allotting an acre or an acre and a half of land to a milking cow, two-thirds of that quantity should be provided; and here she should roam at liberty

with plenty of running water, if possible, and either large shady trees, or an ample shade for shelter; while, at each milking time, she should be supplied with a bundle of tares or clover, of saintfoin or lucerne. Under this treatment she will be found amply to repay the trouble. The principal danger of house-feeding would be obviated. This danger is, that either too much food is given to the cow, and thus nausea and waste occasioned, or the cow does not get it in that clean and sweet condition which might be wished; while she is also deficient in air and exercise; but, with the treatment we have recommended, with a foddering of green food fresh mown, and with her roam in the pasture, she has all the advantages of hand-feeding without any of its objections. She can eke out her meal in her pasture; she has it clean, and has also plenty of air and exercise; while she can consult her own will as to the amount of rest or shelter she takes, in hot or rainy weather.

So much for summer management. In winter it is quite another matter. Some are pinched and starved; others have the cold straw-fold in winter, and are exposed to every blast of heaven. Some have more or less hay or turnips; while others are watched and tended with the most assiduous care. The first is the most costly system.

A writer in the *Cyclopædia of Agriculture* gives an account of the cost of producing a gallon of milk, according to the different modes, which is very instructive, and though it may be a somewhat vague instance which he gives, it so nearly approximates to the spirit of truth, that we cannot avoid quoting it.

The Gloucestershire system, where the cows are fed on grass and hay, and sold lean when unfit for dairy purposes, involves a cost per gallon of milk $6\frac{1}{8}$d. The Cheshire system, in which a few turnips are added, in the winter keep, costs $6\frac{1}{2}$d. The Fifeshire system, of grass pasture in summer, and nine tons and a half of turnips in the winter, with oat straw, amounts to $3\frac{7}{8}$d.; and Mr. Young's plan, in the same county, with a more liberal allowance of extra food, as bean-meal, linseed, &c., costs $5\frac{5}{8}$d. Now, though we might have expected a greater difference in the last two cases, and in favour of the very last in preference to the former, we still see that it is the dearest way of all to starve the cows; and that a moderate degree of attention and care is necessary to the most economical produce of the milk cow, whether it be in milk or butter. When the pastures begin to fail, it is usual to turn the cow upon the fog or aftermath, say in the month of October—for nearly all cowkeepers have of necessity a quantity of grass-land producing hay,—and the after eatage of this land affords

the best possible food for the milk cow, whether butter or cheese be the object sought by the dairyman. When this runs short, a little "hand meat," —a few turnip tops, or rape, or even a little bran mash, will be well bestowed; for if the milk does go down at this period, it is never regained in winter by any care which can be exercised. If town milk is the object, a few brewers' grains would be the most advisable addition to the eatage which could be made. If the weather should still be open and favourable, the pasture, freed in October, will have grown up a little, and will afford a very useful turn-out for the cow; for she must usually be housed at night, when the fog is finished. In the house she should either have hay and mangel wurzel or turnips; or if she has straw, she should have cooked linseed, or oat, or bean-meal mash. The mode of cooking linseed we shall fully discuss in the chapter on cattle feeding; but for small farmers, without apparatus, a very cheap and extempore mode may be pursued without difficulty. The chaff of the barn, after winnowing, may be collected, as free from dust as possible; or, if mixed therewith, it may be sifted and laid by. A bushel of linseed may be added to two bushels of barley or oats, or even wheat, or any other grain, grown in the ordinary way. This may be boiled in a common boiler, taking care to keep it well stirred, to prevent its "setting on" at the bottom of the boiler. After boiling a quarter of an hour, if this be poured upon the chaff in the proportion of one and a-half to two pounds of the meal, and a gallon of water to one bushel of chaff, one of the most useful and certainly the cheapest adjuncts to milk-cow and store-stock feeding will be adopted which can be conceived.

The great objection to turnips, at least in large quantities, is the flavour they impart to the milk and the butter. This is a difficulty which can only be partially got over. It is surprising, however, how few turnips or roots will be required, if the compound system be adopted; and this quantity being so small, it is easy to vary them, by giving potatoes, carrots, mangel wurzel, &c., in an ever changing round.

It is a question whether hay need ever be given, if the compound system be adopted. If it be not, the cows must have a liberal allowance of hay. In Norfolk, oats, barley, or bean-meal, is mixed with chopped hay. It is questionable, however, whether the cow has not more gratification, and hence more advantage, from selecting and masticating the hay alone than can be derived from the cutting and mixture which, at least, is a costly and laborious process. A small quantity, and a great variety of food, will, on the whole, produce the most favourable effect on milk cows.

The Rev. Robert Pulleine, of Kirby Wiske, in a Prize Essay of the Yorkshire Agricultural Society, thus describes his very successful method of keeping dairy-cows in winter :—

"In the management of dairy cows during the winter season, it is of the greatest importance to have a dry, well-ventilated cow-house. The side walls should not be less than seven feet in height; and in the two courses immediately below the top course, every alternate brick should be left out to insure a sufficient ventilation. A rough board on a couple of hinges may be fitted to close the openings, in case of very severe weather, but I have never required it.

"The floor on which the cows stand should be made of well-beaten soil, and behind them a kerbstone about three inches thick and twelve inches wide, to raise them above the channel, which should have a slight fall, to carry off the water at once.

"My cows are tied up in pairs; each pair having a space of eight feet by six feet six inches, which is sufficient room for any beasts under sixty stone weight. They have a crib before them, nine inches deep by twenty inches wide, raised upon twelve inches of brickwork. The advantage of the crib being raised is, that the cows are less liable to get turnips into their throats than when they have to put their heads down to the ground for their food. A rack I consider of little moment, as the hay is all given as chop.

"It is a good plan to take up cows as soon as the nights become cold, say the middle of October, as the white frosts which occur about that time cause them to run off their milk. They are turned out during the day until the middle of November, if the weather keep fine. From that period until May-day they are kept entirely in the house, except being turned out a few minutes every afternoon to water. They are milked at half-past five o'clock, morning and evening. As soon as the man who feeds them comes in the morning, the dung is all removed, and each cow has a feed of 28 lb. of roots :—

"At 7 o'clock.....7 lbs. chopped hay.
" 9 " .....A pail of water, with ½ lb. of bean meal stirred into it.
"10 " .....2 lbs. of linseed cake.
" 1 " (P. M.) ....7 lbs. chopped hay.
" 2 " " ....Turned out to water, and then 2 lbs. of linseed cake.
" 5 " " ....28 lbs. roots.
" 8 " " .... 7 lbs. chopped hay."

Cleanliness is the first requisite in a successful dairy cow-house. The place must be kept free from smells of all kinds, and should be frequently washed and whitewashed, and the animals diligently rubbed, and even curried. A thriving cow out of doors is known by her having the marks of her tongue upon her skin. If she is not at liberty to lick her own skin, she should at least have it done for her. Her litter should be taken away the first thing in the morning, and fresh clean straw given in its place. Above all, she cannot have too much air, if the cold blast be just shielded off. Bad as is exposure, the crowding of cows in close places is considerably more so. There should be free currents of air. Ventilators at the top of the cow-house in the louvre style, open fronts to the south, capable of shutting up in snow or southern rain, and capacious ventilators at the bottom by grates or ventilating bricks, are indispensable to the health of the cows. If these be neglected there can be no hope of health in the cows, or success in the dairy.

The *influence of the food* on the quantity and character of the milk, is a question on which there has been a great deal of speculation. A very scientific agriculturist, Mr. H. Briggs, of Overton, furnished the writer with an experiment showing that the increase of milk, within certain limits, was almost in the power of the farmer, by an addition of bean meal to the ordinary root food and hay. Although, as a general rule, milk may be produced by these costly and stimulative kinds of food at too great an expense, yet it is of great importance in a particular season, or under special circumstances, to know the means of increasing the supply of milk beyond the ordinary quantity.

The researches of the Professors Thomson are well known. They selected two Ayrshire cows, and fed them with malt in various combinations. They found that 100 lbs. of barley, hay, and grass produced 8·17 lbs. of milk; and that the same quantity of malt and hay produced 7·95 lbs. of milk; the former yielding 1·95 lbs. of butter, and the latter 1·92. Now, though this was not at all satisfactory as to the value or otherwise of malt for milk cows,—a proposition never perhaps before seriously entertained,—still it shows how food may influence the quantity and quality of the milk.

Messrs. Dumas and Boussingault tried a number of very careful and interesting experiments on the quantity of milk and its products which would be given by cows fed on different kinds of food. They tried nearly all the combinations usually given, except, perhaps, bean meal; and the result was, that the greatest quantity of milk was produced in every case, when the cow had green clover; thus proving that, in

each instance, this yielded the greatest quantity of butter, and, with one exception, the greatest produce also of cheese; and that exception was when the cow had been but one day calved, which would account for the abundance of cheesy matter in the milk. The table is so instructive, that we shall quote one or two of the items :—

Food.	Days after calving.	Milk.	Butter.	Cheese.
Potatoes and hay . .	176	9·3	4·8	3·3
Hay and green clover . .	182	8·9	4·5	4·0
Green clover . . .	193	9·8	2·2	4·0
Clover in flower . . .	204	7·8	3·5	3·7
Potatoes	229	5·0	4·0	3·4
Turnips	207	6·0	4·2	3·0
Red beet . . .	215	5·6	4·0	3·4

We shall not here enter into the philosophical investigations and reasonings of these experimentalists; but merely add that mangel wurzel, bean meal, and grains largely contribute to the increase of milk; that good hay and oat mash augment the quantity of butter; and that turnips, though they sometimes impart a disagreeable flavour, materially add to the increase of both.

The result of Mr. Pulleine's system of management, in the production of milk, given in p. 101, is as follows; the cows being five in number, viz. :—

1. Yorkshire, 9 years old, had her last calf March, 1850.
2. Alderney, $2\frac{1}{2}$ years old, calved July, 1850.
3. Yorkshire, $2\frac{1}{2}$ years old, calved November, 1850.
4. Yorkshire, 5 years old, calved January, 1851.
5. Ayrshire, 6 years old, calved March, 1851.

He says, "It will be observed that No. 1 and 2 can hardly be called in full milk, and No 3 is only a quey. They produced in the seven weeks, from the 25th of March to the 10th of May, 191 rolls of butter, 24 oz. to the roll, equal to about 254 lbs.—16 oz. to the pound. To this must be added 154 quarts of new milk and 42 quarts of cream, consumed in the house. The milk was not regularly measured, but averaged about 60 quarts per day."

To keep the cow as *long as possible in milk* is sometimes an object. Some cows dry early; some may be milked through, though always with disadvantage to both the cow and her calf; both being feeble and impaired, if it is persisted in. In summer weather, however,

when cows are very deep milkers, and in high condition, it is not only sometimes advisable but absolutely necessary. A cow not put to the bull will hold her milk much longer than one which is regularly breeding.

The *spaying* of milk cows is adopted by the veterinary schools of France, and a great deal is said in its favour by the Academy of Rheims and other authorities. A report on the subject was furnished to the Academy by M. P. Charlier, which spoke almost exclusively in its favour. The practice is an old one in Germany and England. The object is supposed to be to increase the feeding propensities of the animals, but by no means for the purpose to which we refer, and which mainly occupies the attention of the French veterinary school, viz., the prolonging of the period of lactation. The report, which is very voluminous, states a variety of experiments made on cows, old and young—some as far advanced in age as eighteen years; but, in order to realize all the promised advantages, the cow is said to be best from four to eight years of age. The operation is performed on the right side, and does not altogether occupy more than from four to ten minutes. It is seldom fatal, unless the cow is in calf. In some instances the cows are said to go and feed as usual, even after the operation.

The conclusions from the above report, endorsed by the reward of the society's medal, were—that *spaying* increases the supply of milk from the animal after a few days; that there is a steady return of milk of the best quality, less liability to fall off milk, and no troublesome tendency to desire the bull; that in eighteen months the milk does not diminish; that the feeding tendencies of the cow are much increased, and the quality of the beef improved. Nay, it is further said, that in one dairy (the number of the cows not being given), a difference between spayed and unspayed cows in milk was 850 pints per annum;—no great quantity, however, if it were a considerable dairy, and where possibly the best cows were spayed.

There is, we must confess, a barbarity about this practice (needless, we believe,) which makes our kinder feelings revolt at an operation performed for so little advantage, over the gentle, patient, harmless milk cow.

REARING OF CALVES.

This is a process more or less belonging to every dairy-farm. Though every cow does not annually produce a calf, still heifers are usually put to the bull at two years old, and the period of gestation varies from 275 to 290 days. Thus the old fashioned mode of reckoning three

months back in the almanac, is by no means a difficult way of ascertaining the date at which a cow put to the bull may be expected to calve. She is nearly three years old before she produces her first calf.

It too generally happens that little skill or care is used in selecting a male animal. A neighbour has a bull, and that is enough. A farmer may have no opinion of the neighbour's skill or judgment. He asks nothing about the breed or the blood. He may see him, or he may not. It is no wonder that such brutes of animals are produced. Encouragement is given to a careless indolent selection of male animals, and bad breeds of cattle are extended and perpetuated.

Five or six weeks after calving, the cow will again be disposed to take the bull; but it does not happen that she always holds, and, if the month of June passes before she is bulled, she calves at a period of far less value to the breeder. In some cases a tithe only of the dairyman's cows are in calf. He loses both produce and milk; for, whether in calf or excitement every twenty-one days, it produces a most unfavourable influence on the milk of the cow and that of her companions. There are a variety of remedies suggested for this sad defect. Bleeding, confinement, and abstinence at the period of bulling, and omitting to carry the animal to the bull for one return of the season, are amongst the most likely resources of the breeder. Some adopt the plan of throwing a pailful of cold water over the loins after the cow has been served, which, it is alleged, gives contractability and tone to the system. It can do no harm. Sometimes a change of bull is advantageous. It is also desirable to send them in the morning before milking.

But sometimes the reverse is the case. The cow *refuses to come in season.* For this difficulty various panaceas are proposed, the most reasonable of which is the giving the animal a quart of the milk of a cow in season. At the end of three weeks, it is alleged, she will take the bull; and a second return will be a fruitful conception. We state this as an axiom of old dairymen. It deserves record as an opinion,—for we never saw it in print,—and therefore we leave it for future experimentalists to settle.

To bring up a calf for the butcher is the easiest thing possible. They have only to suck the mother for the requisite number of weeks, till they are of size and fatness required for the taste of the consumer, or the judgment of the buyer. But to rear calves for store purposes is a different affair. Breeding farmers have to bring up perhaps eight or ten calves, with only four cows. They buy them in the market.

They must necessarily nurture them on artificial food; and it is their business to feed them, in order to bring them to a favourable state of growth and maturity, on such substitutes for milk as shall be the least expensive and most efficient. Their own calves are more easily brought up.

The materials usually employed are new milk, skimmed milk, meal-porridge, linseed-tea, and (for solid food) hay, grass, turnips, meal, potatoes, mangel wurzel, &c. Some breeders, whose object is the calf, and the calf alone, sacrifice every other consideration to this. The breeders of short horns, whose early maturity require a corresponding early supply of nutritious food, generally apply nature's own provision, and allow the calves to suck either their mother or some other dam; or, in some cases, more than one cow, in order that they may develope their precocious and distinctive qualities. This practice they often continue for six or twelve months. It is, however, an expensive mode of feeding for those who rear only ordinary cattle for the market. Moreover, some are so "stingy," that as soon as the cow ceases to give "beestings," they begin to give the calves skimmed milk. A process of this kind does irreparable injury to the young animal.

The best mode, with ordinary calves, is to give new milk for at least fourteen days after the calving. There are two modes of doing this: either to allow them to suck the dam, or to remove them as soon as calved; but train them to drink in the first instance. For ourselves, we think that taking away the calf is both cruel and unnatural. The healthiness of the mother, we consider, depends upon it. After calving, it is only necessary to see the anxiety and care for her offspring, which makes her forget all her pain, and diverts her attention from her sufferings; whereas, if you subject her to the gloomy excitement of losing it, it is no wonder that milk fever and inflammation so often supervene. We invariably allow the presence of the calf for at least a fortnight. We suffer the mother to lick over the whole of her offspring, because we think that a privation of this medicine of nature is a cause of many a valuable animal being lost. After the first fourteen days we mix one half new and one half skimmed milk for fourteen days more; this skimmed milk is scalded nearly to the boiling point, set aside to cool, and given to the animal. One great secret, in the successful rearing of calves, is to give them frequently small quantities of food at a time. For the first fortnight, it ought to be fed, at the very least, four times per day. About a quart at a time will be necessary; which quantity may be increased

afterwards as the animal's wants may require it. Soon after this the skim-milk time commences, when the animal, if properly trained, will begin to eat the solid food.

Teaching them to eat is a matter less difficult than that of training them to drink. Nature presents to them, first a sucking then a drinking process. In training them to drink it is generally necessary to use the finger, which, while dipped in milk, is introduced into the mouth of the calf. The young animal then sucks the finger, and thus imbibes the milk. By and by the finger is withdrawn, and the calf drinks alone and unassisted. The eating process is somewhat differently taught. A piece of fine hay is tied together with a string, and suspended in the calf-crib. The calf begins to suck this bunch of hay; and part of it coming out from the string, the calf is gradually taught to eat.

Some parties tie up the calves by the neck in stalls and other places. Others keep them loose in houses. We prefer the latter course. The exercise the animals take is beneficial to their health; and, on the whole, we much prefer this partial freedom.

The supply of milk, however, on most farms is limited. If the farm is not confined to dairying purposes, the milk cannot be spared: and, if new milk cheese is made, it is equally in request. Hence *substitutes for milk* have necessarily to be adopted. Hay-tea is one of the substitutes sometimes used for milk. We think it generally a poor one. If it has been made from hay grown on very rich alluvial soils, so much the better; but there is every probability that the bitter extract may, with the colour, deceive, and lead to the belief that it is more nutritious than it really is. Take good meadow hay, and deduct 44 per cent. for woody fibre, and for saline matter, which varies from 5 to 10 per cent. (most of it being held by the organization of the plant); and about 50 per cent of starch, sugar, gum, gluten, albumen, legumen, and fatty matter remains in the tea. Many parties make a point of boiling the hay; but we do not consider that there are any great advantages derived from the practice. Mr. Parkinson's plan is about the best with which we are acquainted. His tea is made by placing in a tub a quantity of good hay—such as has a sweat in the stack—is of a brownish colour, and feels clammy like tobacco,—then pouring boiling water upon it, and covering it up to keep in the steam. This infusion ought to be prepared twelve hours before using; when the milk, being boiled, should be added, till the mixture is reduced to a proper heat.

We believe that food for calves may be prepared of a much more

nutritious nature, and with more probability of advantage to the producers. We shall therefore proceed to enumerate the various kinds of food on which we have successfully reared calves for several years past.

1. *Wheatmeal Porridge.*—This is made in the followiug manner:—Boil two gallons of water, and mix a pint of fine flour with cold water, sufficient to make it into the consistency of a thick cream. This should be thoroughly mixed, and put into a bowl capable of holding half a gallon. A small quantity of the hot water is added to the mixture, and stirred so as gradually to raise the temperature of the flour and water in the bowl, and prevent it from running into lumps. This is plunged into boiling water, and stirred until the whole boils again. It thus coagulates the mass, and forms a thick nutritious porridge. It is a great improvement to the mixture if one-sixth part of old skimmed milk is mixed with it; which not only gets scalded itself, but very materially improves it. Two gallons of the mixture per day will be found sufficient.

2. *Linseed Jelly*, combined with the milk, is a very valuable auxiliary. We ourselves have scarcely tried the seed by itself sufficiently to be able to give a very decided opinion upon it. We much prefer the pressed seed, in the shape of cake, crushed to a powder; and for this reason, if we wanted to lay on fat, we should give them the crushed seed, because its fatty matter would, when cooked, be easily assimilated into animal fat; but when bone and muscle are to be formed, every pound of fattening matter in the food displaces other substances calculated to build up the animal structure. For this reason we most approve of the jelly produced by the crushed cake. The proportions of this cake to the water should be as follow:—To two gallons of water take two pounds of oil-cake bruised or crushed nearly to a powder, sprinkle it in the water, stir, and allow it to boil ten minutes. Cool with skim-milk, if convenient. A rich jelly-like mass, of the most nourishing kind, is produced, which should be given in a lukewarm state.

3. *Broth Porridge.*—This appears an unnatural mixture; but it is often used very successfully, combined with other mixtures, for feeding calves. The water in which bacon has been boiled is carefully preserved, and diluted with perhaps one-half of its quantity in water. It may be expected that a substance like bacon, from which nitrogenized and phosphoric matter may be expected to be dissolved by the action of boiling, will be of use; but, to make it elementary, it is necessary to mix it with a considerable proportion of milk. However unnatural

this mixture may appear, and however contrary to all theories of natural history it may seem, to give carnivorous matter to herbivorous animals, still we may find an analogy, by no means unimportant, in the disposition evinced, by mature animals of this description, to select and chew, for hours together, a piece of bone, which they will search for with instinctive pertinacity, and relinquish with reluctance. Is it not because the animal finds in it nitrogen or the phosphates denied her in the food upon which she is confined? If this be so—if she is guided by her instinct to select and choose animal matter—why may not a decoction of animal substance be useful to the calves, in their younger stages, as an auxiliary, and, to a certain extent, a substitute for the beverage which nature has given them, but which man denies them.

Solid food for calves will soon, however, displace much of the liquid. At five or six weeks old they ought to be trained to eat sliced roots. To do this it is only necessary to supply them, in convenient forms, in a trough within their reach. Their moments of leisure will be employed in playing with and sucking those pieces, until they begin to masticate them. The roots should, for this purpose, be cut into oblong pieces, one inch broad, half an inch deep, and two inches long. These shapes, being more adapted to their conformation, and better calculated to make them learn to eat of their own accord, are better than either slices or squares. Calves should be reared from the months of September to March. We do not approve of late-bred calves. If they are reared late, they become tender, and require nursing the following winter. In the months we have named, however, turnips are always plentiful; or, if mangel-wurzel is cultivated, it will be found a very successful substitute; although we prefer Swedes. These appear not only to agree with the palate of the animal, and to make it thrive, but they exercise a very beneficial influence on its subsequent development. Is it because they contain a large share of the phosphates? Sprengel makes the relative proportions of the phosphates in the Swede to be nearly six times as great as in the common turnips, and sulphate ten times.

	Phos. acid.	Sulph. acid.	
Common turnips .	73 ..	41	per 1000 lbs.
Swedes . .	408 ..	890	

Other auxiliaries are sometimes adopted, such as bean-meal, pea-meal, oat-meal, cattle sago, and Indian meal; all these being very material aids in rearing calves. It not unfrequently happens, how-

ever, that some peculiar root or grain may be purchased at a much cheaper rate than any product of the farm can be grown.

Great discussions have taken place as to the mode of feeding calves adopted by Mr. Huxtable. He proposes to accomplish it at a cost very different from any other breeder. We should fail in our duty if we did not give his plan, and also the cost as it really occurs in Scotland.

MR. HUXTABLE'S PLAN.

	£	s.	d.	£	s.	d.
First month:—						
Two quarts, daily, of new milk, at 1½d. per quart, for each week	0	1	9			
Six quarts, daily, of skim milk	0	1	3¾			
	0	3	0¾			
			4			
				0	12	3
Second month:—						
One quart of new milk, daily	0	0	10½			
Five quarts of skim milk	0	1	1¼			
Half a pound of oil cake	0	0	8			
	0	2	7¾			
			4			
				0	10	7
Subsequent cost, viz.,						
From third to twelfth month, 150 lbs. of cake at £7 per ton				2	15	0
During last six months of second year two pounds of bean-meal daily				1	2	0
Attendance for two years				1	14	10
Calf born on farm, price, if then sold				0	9	0
Total				£7	3	8

MR. NICHOLSON'S PLAN—SCOTLAND.

	£	s.	d.
Forty-five day's milk, four quarts, at 1½d.	1	2	6
Mixed gruel—wheat and linseed, four quarts at 1½d.	0	7	6
Carry forward	£1	10	0

	£	s.	d.
Brought forward . . .	1	10	0
Forty-five days of the same mixture, in double quantity	0	15	0
Hay, cake, and turnips, at 1d.* . . .	0	3	9
Grass from June 1 to October 15, at 10d. per week	0	15	10
Second summer's grass	2	0	0
Ninety days' oil-cake, three pounds daily, at £7 per ton	0	16	8
Price of calf, if bought	1	10	0
Loss from death, at ten per cent., on £6 13s. 7d. .	0	13	0
Attendance for two years	1	0	0
Total cost	£9	4	3

The *degree of confinement* to which a young and growing animal ought to be subjected, is an important consideration. The close confinement of a Highland kyloe would give him the rickets and disease. But a short-horn will bear confinement, and thrive better with it than with excessive liberty. We do not approve of tying an animal constantly by the head when very young. It is in opposition to natural and healthy exercise, and renders the animal unfit for the purposes of life. The writer, who has fattened animals at eighteen months and two years old, which are necessarily very much confined, has had young animals whose bone was too supple to carry the heavy body; and their legs have literally broken while taking them away to the slaughter-house. But absolute confinement in the case of calves is much worse. It prevents their growth and healthy development, and is the parent of many diseases.

Cleanliness, above all, should not be neglected, either in the food or the litter, or in the calf itself. If food too hot is given, the calf will be surfeited, and lose its health and hair; if too cold, it will be starved, and liable to disease; if sour, it will have shoot, or scour; and if strongly fermenting dung be allowed to accumulate where it is kept, it will, ten to one, become disordered in its bowels, a disease which, when once begun, will go through the whole pen of calves, unless the one attacked is at once removed. In this case white-washing the house and stall daily will be necessary, and plenty of

* During the first winter, 210 days, 6½ tons of turnips would be consumed, at the rate of 70 lbs. per day, and in the second winter, 215 days, 17½ tons, at the rate of 182 lbs. daily. The cost would be less if the calves were both reckoned at the same price.

fresh air should be afforded. Quicklime scattered on the floor will be beneficial.

To avoid all these evils, loose confinement in stalls, with the front fastened up (which enables them to walk about without escaping, and allows them company without actual contact), is by far the best plan. The open causeway before the stalls will afford them plenty of air and light, while their constant trampling will keep the manure beneath them from fermenting. They will then only require to be well littered; for it will starve them to be too frequently cleaned out in winter. They will have at all times a warm bed below, with plenty of air above; and the litter will be so consolidated as never to putrefy to any objectionable or inconvenient extent.

In feeding stock the worst policy of all is to stint the calf of food in its early stages. That calf may be said to be always fat, which never loses its first layer; and as the difference is often a question, in after-fattening, of some six months' keep, there can be no question that it is of the greatest importance to keep it well at first.

Giving the calf that food which is easy of digestion, and suited to its feeble stomach in early life—allowing it especially its mother's milk, the beestings, and the soothing influence of its mother's tongue—weaning it from new milk gradually and cautiously with a plentiful allowance of good sweet hay—are the real elements of success in calf breeding. This course, with a proper attention to air, warmth, exercise, and cleanliness, is all that is required in the proper management of young calves.

CHAPTER VII.

CATTLE-FEEDING.

It might be supposed that in a pastoral country like this, when *fat* has ceased to be a luxury at the tables of the great, and has become a necessary of life to the mass of the population, that all the modes of fattening cattle would be so well known, that a tyro might be able to describe them. But they are only beginning to be investigated in their main element. Everybody knows that rich alluvial pasturage, that linseed cake and Swede turnips, that combinations of hay and bean-meal, and ground corn, with a dozen kinds of roots, will feed cattle sooner or later. But the question now is simply one of *economy*—*How can the greatest number of pounds of beef be produced at the least*

possible cost? This is the real question still unsettled; and on this we will proceed to show the extent of our present knowledge.

First, the grazier must select such animals as will lay on fat rapidly; and, by a physiological law, as we have seen, there are those which will soonest attain maturity so as to be fit for feeding. We stop not now to examine whether or not the two principles of taking on fat early as well as rapidly are necessarily connected—though it is very probable they are—and that a tendency to lay on fat will show itself at a very early period of the animal's history; though it may possibly be a mere result of the breeder's skill to obtain the two qualities combined.

Now, every good grazier knows an animal that will *thrive*—that being a simple matter of judgment. A skilful man will select out of a drove, five, or ten, or twenty animals; and nineteen of the twenty will be the best graziers for his particular farm. The eye guides him partially, as well as the signs we have described in the chapter on the breeds of cattle; but, more than all, he is directed by the *touch*.

After selecting the animal, the mode of feeding him is to turn him out into a grass field skirting a river (if such be within the grazier's power), where the alluvium of ages has been washed into the soil so deep that the roots of the herbage cannot find its bottom, and so firmly comminuted as to admit of the minutest filaments of the radicles of the plants to penetrate it with facility, so porous as to admit the air to enter, and the water to filter gently through; and altogether retaining its elements in a state of solution so delicate that they are ready for food to the plants which consume them; and lastly, though of greater importance than all, having the elements of vegetation in abundance. Now all men know that on such a soil, in five, six, or even in four months, a lean animal will become fat. He has all he requires. A little attention, to see that he is *well*, is all that is required, from the time of his being placed in the pasture to his being taken to the butcher. There is neither labour, nor pains, nor expense incurred. He is worth five pounds more when he is taken out than when he was put in, and that is all the grazier knows or cares for. Now we shall find out the requisites here for feeding strictly laid down. There is plenty of fresh and highly nutritive food; there is scarcely any labour in searching for and obtaining it; with water, and shelter, and warmth, and also plenty of air, and freedom from constraint. This is what the feeder must aim at in his winter-fed cattle. They cannot feed in the open air; the cold and wet would starve off the flesh as fast as the food laid it on. Here he must provide *shelter*.

Now, one of the controversies of cattle-feeding in winter is, which is the best mode of effecting it. The Scotch farmer loudly contends for full and perfect liberty to the animal. If he is too warm he will sweat, and if too closely confined he will fret and murmur; and he declares that practice has decided that they should be fatted in open hemmels. A sheltered shed they may have, but nothing beyond it. The midland counties man says this exposure is dreadful. It wastes their beef, and renders them subject to disease, and involves long feeding. Another class again insists on the tying up of the animals as injurious to their health; that a little exercise, but absolute confinement, are equally necessary; and that they should have shelter with freedom.

These two classes are controverting the merits of box and stall feeding. And both of them may be right. Take a Highland Scot, consider his wild habits, his long stray of mountain and glen, his wide-spread pasture of peat and heather, from which he could in his native fastness smell afar off his friend or his enemy, man! Tie him by the head, and he becomes fretful or furious; he will pine, and fret, and worry himself; while in his gregarious state, with a herd of his fellows in open yards, or hemmels, he will thrive. Nay, he has a nature which will lay on fat despite the cold and wet, as the rye among plants can assimilate food from the barrenest soil; so he has a natural shelter in his hair and constitution, for which the owner of more delicate and tender animals will not give him credit. He forgets that the Scotchman has a different animal to deal with in his hemmel-feeding from the delicate southern short-horn.

The short-horn feeder, on the contrary, possesses a tame, quiet, gentle, lethargic animal, which shows that universal mark of good breeding in men and animals—he is always *quiet*. He will neither pine at never beholding the light, nor feel the want of exercise if he never leaves his stall, provided he has food and comfort in plenty. Nay, he will hardly take the exercise necessary to keep his limbs in healthy action. But we should keep him from the cold and wet, and prevent the blast from passing over him, or otherwise he will wither like a summer flower; he needs protection, and thrives best in boxes.

Take a Devon, or, if you like, a Sussex ox. He is large and cumbrous; but he is active. Give him liberty, and he will roam and harass himself; but he is tame enough to keep to his stall without pain or fretting. He requires a stall. He needs a mild climate and shelter, and he is best confined by the head.

The *temperature* at which it is desirable to keep feeding animals is a matter of more importance than might be inferred from the little consideration bestowed upon it. A discussion took place at the Leeds meeting of the Yorkshire Agricultural Society as to the management of feeding animals. The question is, are we to run the risk of a wasting expenditure of food by perspiration under excessive heat? or are we to induce them to burn it up, to keep up animal heat, by exposure to too much cold? Nay, will not different classes of feeding animals be subject to different consequences, from the same degree of heat?—In the same cow-house there may be some too hot and others too cold, from their different constitutions. Oxen generally sweat at a temperature in which heifers thrive admirably. This happens at any rate till Christmas; after which they seem to be able to bear the same degree of heat as female animals.

H. S. Thompson, Esq., to whose indefatigable and well-directed efforts farmers are much indebted, tied up two sets of feeding bullocks, —eight in a warmer shed than the rest. They had the same quantity and kind of food; but those in the warmer shed made more beef than those in the colder; thus showing that warm air, as well as warm food, was highly favourable to fattening short-horns; which breed, we believe, he invariably fattens. The temperature he aims at is about 55° to 60° of Fahrenheit. An increase of this caused them to get off their food, and lose their tone and appetite.

Stillness, with the limitations given in our remarks on shelter, is necessary to successful feeding. This is well known to geese feeders, who oven nail them to the boards. The fact was shown very strikingly by Mr. Childers, M.P., in his experiments on shed-feeding, and by Lord Bathurst, in stall-feeding sheep. An animal, in the very effort of searching and securing his food, expends the principle necessary to make him fat; hence it is necessary that his turnips be brought to him, instead of driving him to the turnips. They are cut and placed before him, that he may have as little effort as possible in the operation of chewing; and he should have ample allowance of room, so that when he is fed he may lie down and sleep.

It is a question whether animals feed fastest in the *dark* or not. There can be no doubt whatever that anything which distracts their attention, which excites action, or which produces nervous irritation, is opposed to fattening; and as darkness will induce sleep, and promote quietness, it is so far favourable; but it is not so easy to have darkness and sufficiency of fresh air at the same time; and therefore the best possible state, perhaps, is to have the feeding-houses rather

in a state of shady gloom than in absolute darkness. A certain amount of nervous energy is necessary to give tone to the vital powers. Beyond this, repose and quietness are easily attained by a simple gloom; while shelter from flies and heat in summer, and from blasts, wet, and extreme cold in winter, should be carefully provided.

Abundance of good food, and regularity of feeding, are essentials in all kinds of fattening. Though it is not desirable to allow the animals to have food standing before them when they are filled, they should never, on the other hand, experience a single feeling of want. The usual hours of feeding should be strictly adhered to, for the two-fold purpose of inducing regular periods of sleep, and for supplying the system with food at the first call of appetite.

Variety of food is a most essential element of rapid fattening; and it is not far from the truth to say that all kinds of food are *equally* fattening, if they are given in sufficient variety. If roots, grain, and hay be changed every few days, the appetite is never cloyed; and the whole are devoured with a relish which develops fat in the most rapid manner.

The *formation of fat* is the work of the grazier. His animals are generally full-grown, or nearly so; and though there may be a small increase of muscle, still the bulk of the material of increased weight is *fat* and not *flesh*. In this country, food to be palatable—to be consumable—must be fat. Unless it has this recommendation it is absolutely unsaleable. The appetites of the higher and the necessities of the lower classes urge on the demand for fatted beef, mutton, and pork; and any meat brought to market in a state other than fat is looked upon as carrion. The members of the operative's family have to content themselves with the vegetables and gravy, while the head of the family consumes the flesh, to enable him to perform his labour; and thus, when the fat is not available, one important source of the food of his household is dried up. Hence the grazier must supply the whole of his animals in a fat state to the consumer. Therefore it is not the number of animals, nor their weight in pounds and stones, he has to consider, but he has to provide for them the means of fattening before they can be brought to the consumer.

The saccharine matter of vegetables, and their starch, will supply the means of fuel-food. The fatty matter will produce ready-formed fat, and the albuminous matter will afford the flesh which animal waste is continually throwing into the excretory system.

It is not our intention to enter into the disputes between two great schools of physiologists, as to whether the fat was formed by transmutation of the sugar and starch of the food, or whether it con-

sisted of the ready-formed fat of the food on which the animals fed. Without for one moment pretending to settle this point, it is at any rate desirable so far to supply both saccharine and fatty matters, as shall give the system the choice of selection.

Preparation of food for the animal's stomach, or a system of cooking, is a very important question. Steaming hay, potatoes, and turnips has been tried very carefully in Scotland, and failed. For *cattle*, at least, it is useless, however valuable it may be for pigs. Yet it is certain that, with certain combinations, all that a feeder can desire is attained by the *cooking of linseed.*

The fat of animals is strictly analogous to vegetable oil. Its elements are much of the same character as sugar, starch, and gum; and no doubt is entertained, by physiologists and chemists, that the fatty matter(vegetable oil) in plants is assimilated into animal fat, with but little change. The elements of those compounds severally are :—

	Sugar.	Starch.	Gum.	Mucilage.	Animal fat (stearine).
Carbon	12	12	12	24	71
Hydrogen	11	10	10	19	69
Oxygen	11	10	10	19	7

The oil contained in many seeds is given by Professor Johnston :—

	Oil per cent.		Oil per cent.
Linseed	11 to 22 say 17	White mustard	36 to 38 say 37
Hemp-seed	14 „ 25 „ 19	Sweet almond	40 „ 54 „ 47
Rape-seed	40 „ 70 „ 55	Bitter do.	28 „ 46 „ 37

This would naturally indicate that any of these seeds would, so far as they were palatable, be useful; and when linseed contains as much as seven per cent. of mucilage, ten per cent. of sugar, and fifteen of soluble albumen, it is clearly indicated as being a seed most valuable for feeding and nourishing purposes. Various attempts have been made to adapt it to the feeding of cattle. There was some difficulty in grinding it by ordinary mills, as it clogged up the teeth; and when given to animals, either alone or combined with considerable quantities of corn, meal, or other feeding matter, the effect was purgative, and but few breeders persevered in the use of the seed alone. The demand for the oil, however, induced the crushing of the seeds to obtain it, and the refuse left was found to be very valuable as feeding material; while the portability of oil-cake, its cleanliness, and capability of being long kept, made it a general and desirable food, both for growing and feeding stock. The oil abstracted, the cake contains, according to the same accurate authority :—

Water	10·05
Mucilage	39·10
Albumen and gluten	22·14
Oil	11·93
Husks	9·53
Saline matter and sand	7·25

We do not see exactly how the cake can contain so large a proportion of oil relatively with the seed; but it is probable that the seed had originally contained a large proportion of oil, and that it had been but indifferently crushed. Good English-made cake, however, has been thoroughly established as one of the best of fattening products; and the extensive farmers of Lincolnshire and other places expend upon a single farm, in one year, as much as £400 to £500 for this article of food. So well understood is its fertilizing character, that many landowners are willing to make themselves, and their incoming tenants, chargeable with proportions of the money so expended, at the rate of one-half to one-third. It is the opinion of some of the best farmers, that when cake can be purchased at the same price per ton, in pounds, that beef and mutton can be sold at per stone in shillings, it will he paid for in the cattle and animals fed, without reference to the manure. The price of cake, however, depends on no such element of calculation. The demand for it has increased far beyond that of the oil, and in some seasons it has been so great, that the former became an object of commerce rather than the latter, and realized as much as twelve guineas per ton.

Attempts have been occasionally made to render the uncrushed seed available by a cooking process; but it has been generally found more adapted for calves than for store-stock or for fattening. Where used at all for the latter purpose, it has only been to supply a deficiency in turnips, which took place in the years 1825, 1826, and 1827, in consequence of the excessive drought throughout England. In these years linseed, in various shapes, was used as a substitute.

The most decisive step, however, in the use of cooked linseed, was taken by Mr. Warnes, of Trimmingham, near North Walsham, in Norfolk, in 1841, when a discussion on feeding cattle with linseed cake was appointed by the Farmers' Club. Mr. Warnes commenced by inquiring into the nature of cake, which he found consisted of the refuse of linseed. He immediately commenced a series of experiments with linseed in various forms—both crushed, steeped, boiled, and cooked in various ways. He also tried the boiling of barley and other

food on various animals. He ultimately adopted a mode of feeding, on what was called by him linseed compound. He carried out, in connection with his experiments, growing, dressing, and preparing the flax, the feeding of cattle with the prepared seed in boxes as antagonist to tying up, and the summer grazing of cattle by soiling.

In order to witness the whole of these processes, which were exciting much attention, not only in England, but in Scotland and Ireland, we paid a visit to Trimmingham. We were received by Mr. Warnes with a friendliness and hospitality which bespoke a philanthropic and well-regulated mind. He laid before us the whole of his plans with a degree of candour and openness, which showed that his object was to benefit others, and not keep his discoveries exclusively to himself.

His cooking apparatus is so simple that it is managed by a blind man, whose happy countenance bespeaks neither over-weening anxiety, nor unremunerated toil. The apparatus consists of two cast-metal boilers, fixed in brick, with a fire-place beneath them. The water is made to boil before the linseed is put in. The seed is crushed by a very powerful implement, made by Messrs. Harwood, of Ipswich, consisting of two cylinders, one of them of large diameter. They are made to press upon each other in their revolutions by two lunar springs, and two men will thoroughly grind two bushels in ten minutes. At this rate the men are able to work the whole day. The mill is, however, capable of being reduced to the capacity of one man. The crushed linseed is sprinkled upon the boiling water at the rate of one gallon of seed to eight gallons of water. Great stress is laid on sprinkling the linseed very gradually; otherwise it is apt to adhere in lumps, and cleave to the sides or bottom of the boiler. With this precaution, however, Mr. Warnes assures us that he has had no instance for several years of this occurrence. This mixture is boiled six minutes, and for that period is slightly stirred. At the end of that time it is found to be a thick gelatinous mass. In about one minute the mass appeared more mucilaginous, and we think was improved. Nine bushels of cut pea straw were then placed very gradually, and by one bushel at a time, in a tub twenty-eight inches high. The liquid jelly was now taken out in the scoop, and poured upon it. As each addition was made the whole was rammed down by a kind of beater, more for the purpose of mixing the mass, and confining the heat, than for any other object.

The present cost of the animals in linseed is 3s. per head per week. In addition to this they have about one bushel of cut Swedes per

day. The animals to which Mr. Warnes at present gives the compound are seven cattle, nine horses, and forty sheep.

Mr. Warnes occasionally mixes his compound with corn, or rather with meal. This, when used, is also sprinkled over the boiling mucilage; but when we saw the process corn was not used. So soon as the first boiling was nearly emptied from the boiler, it was again filled with water, and was ready for another boil, when required.

We examined the stock carefully, and cannot compliment Mr. Warnes on the happiness of his selection. The sheep were French; and to fatten them, we should say, was next to an impossibility. The cattle were also hard feeders, but were evidently progressing rapidly.

As a test of the value of his system, Mr. Warnes has furnished us with the following remarks and experiments as illustrative of the general effects:—

"Linseed," he says, "has five essential properties, viz., mucilage, oil, albumen, gluten, and sugar. The shell, or external crust, is the hardest of all seeds, and the most difficult to break in pieces; but not too hard for the miller, who has every particle ground almost to powder, in order that all the oil may be expressed, which it could not be if coarsely crushed. This is demonstrated by the cake, in which the presence of linseed is scarcely apparent. To a similar state linseed for the cattle compounds ought to be reduced; otherwise some, at least, of the properties above described will pass off without benefit to the fattening animals. This the scientific grazier will discover by the excrements, in which he will find sufficient cause, not only for grinding linseed, but also for grinding all grain or pulse, if possible, into flour. From researches like these the profitable returns for grazing upon my premises, may be dated; returns such as are represented by the following figures:—

	£	s.	d.		£	s.	d.
7 Durham bullocks cost .	59	10	0	... Sold within six months for	136	10	0
10 Scotch do.	100	0	0	... Ditto. do. . . .	215	0	0
1 Cow	5	5	0	... Ditto. do. . . .	15	0	0
10 Miscellaneous small cattle	40	5	0	... Sold within nine months	136	0	0
Balance down . . .	297	10	0	...			
	£502	10	0		£502	10	0
					£297	10	0
Deduct for 14 qrs. of linseed, mostly grown upon the farm, £35; and £4 for barley meal					£39	0	0
Return for 19 acres of turnips, several acres of pea straw, and about 3 months' autumnal grass for the 10 miscellaneous cattle . .					£258	10	0

"The linseed, with the pea-straw and turnip-tops, were formed into compound, the turnips given raw, and the barley-meal as circumstances required. Under the old system, the turnip-tops would have been mainly destroyed, and the pea-straw used for litter. But these having been employed as above described, will account for the small consumption of turnips, and show the immense importance of such auxiliaries."

The expense of this copper, with the whole working apparatus for eighty or a hundred head of stock, Mr. Warnes states, will not be more than four pounds.

A part of Mr. Warnes' system is the feeding in boxes, the growth of linseed, the manufacture of the fibre into flax, and the soiling of cattle with green food and compound in the summer. It would swell this article beyond its legitimate limits, if the box system were more fully described. It may suffice to say, that the boxes of Mr. Warnes' have been put up very cheaply. They form two sides of what has formerly been a fold-yard. The sides have had a roof put along the wall, supported by pillars of wood, and divided by rails of any ordinary wood; the front next the yard being inclosed by two gates. The box is eight feet six inches square. Adjoining the wall is a passage from which the food is given in troughs, which are made to slide up or down as the manure accumulates. The manure is never carted out until it is taken to the fields; and as the boxes are walled for one foot from the bottom, there is not the slightest escape of the liquid manure or of the ammonia, and therefore it is peculiarly rich.

We observed, in various parts of Norfolk, many kinds of boxes, much after Mr. Warnes' model, and some of a more costly character, which the owners might possibly consider as improvements; but, as Mr. Warnes' boxes may be erected at small expense, we say thirty to forty shillings each, and may be removed legally by a yearly tenant, they are entitled to preference.

Much has been said as to the dirt and filth, and unnatural state of the animals; but their condition is precisely the reverse; they are quiet, have exercise sufficient for healthy secretion, can feed at leisure, aud, wherever we observed them, they were clean and free from smell, and everything objectionable. The fact of the treading, and thorough consolidation by the animal's feet, prevents fermentation, and neutralizes the consequent evolution of gases, which would take place if mere stall-feeding were practised. On the whole, we think there are many more valid reasons in favour of than against box-feeding.

The direction given to men's minds by the experiments of Mr.

Warnes, induced trials with all kinds of modifications of linseed-cooking; but the one which has obtained the greatest amount of favour is that adopted by Mr. Marshall, late of Holme Lodge, near Thirsk. The difference between Mr. Marshall's plan and that of Mr. Warnes is, that the material cooked has not the heat applied to it directly, but to the outside of the boiler in which it is to be cooked, so that no direct application of the fire shall take place, to burn the mucilaginous matter. Mr. Marshall insists that, to cook the material properly, it must be boiled at least two hours.

His mode is this:—One pound of linseed is boiled for two or three hours in about one gallon and a half of water. Five pounds of straw are chopped, say one inch long, and mixed with two pounds and a half of ground oat or barley meal very intimately, which is then placed on a floor of flags or bricks, and the boiled linseed is poured upon the mass and turned. It is then allowed to cool for one or two hours, when it is ready to be given to the cattle. The numbers enumerated below are for one animal, though, of course, the food for a larger number may be cooked at the same time, preserving the same proportions. Linseed being at six shillings per bushel, the cost for each animal per week will stand thus:—

	s.	d.
12 lbs. 6 oz. of linseed per week	1	$4\frac{1}{2}$
32 lbs. of corn, at $11\frac{1}{2}$d. per stone	2	$2\frac{1}{4}$
Labour divided per head	0	$6\frac{1}{4}$
Coals	0	$0\frac{1}{4}$
Interest of cost of apparatus	0	$1\frac{1}{2}$
	4	$2\frac{3}{4}$

Mr. Hutton, of Sowber Hill, who has carried out the scheme very fully, gave the following experiment with the linseed compound, as compared with oil-cake. In this the turnips were charged, as well as the compound, to make the terms equal.

Sixteen polled beasts (cows) were taken up. They were divided into two lots; each lot consisting of eight beasts, and as nearly equal in weight and condition to the other as possible.

One lot, costing 6s. 10d. per head, was fed as follows:—

	s.	d.
Linseed cake, 3 stones, at $13\frac{1}{2}$d. per stone	3	$4\frac{1}{2}$
Turnips, 980 lbs.	3	0
Labour	0	$5\frac{1}{2}$
Per week for each head	6	10

The other lot was fed upon prepared food:—

	s.	d.
Linseed and ground corn	4	4
Turnips, 490 lbs.	1	6
Labour, &c.	0	5½
Coals	0	6
Per week for each head . .	6	9½

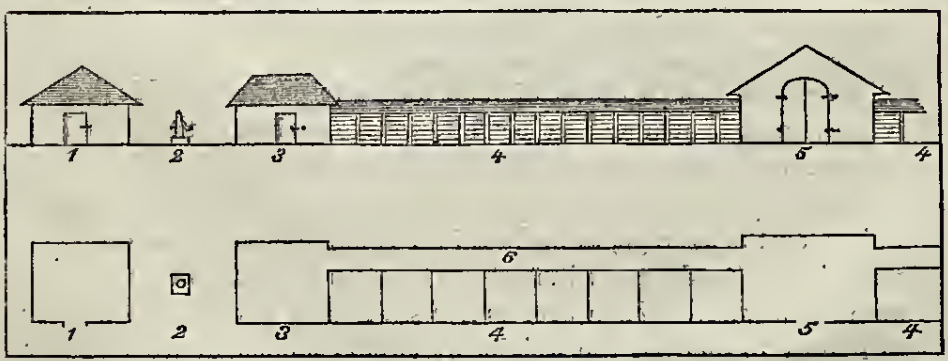
The two lots were sold at Bedale market, on two different days; four being taken from one set of beasts, and four from the other set, at each sale. The cattle fed upon prepared food realized £2 6s. 6d. more than those otherwise fed. The time occupied in feeding them was eight weeks.

The cost of the apparatus and fitting will be about £50.

On the whole, we think it very desirable to adopt one or the other process in all situations where an increased quantity, and better quality of manure is a desideratum, not to mention the more profitable return, as exhibited in both the systems described.

Mr. Warnes, altogether unprejudiced in favour of his own peculiar system, was, when we visited him, making experiments on the mode recommended by some graziers, of steeping the linseed-meal in cold water for some twelve or fourteen hours—when a slight mucilaginous deposit was the result. The experiment will, no doubt, be carefully and accurately made under his direction; but our prepossessions, we confess, are in favour of the cooked materials.

The following is a plan of Mr. Warnes' shed-boxes for cattle-feeding, erected by Sir Charles Burrel, Bart., M.P.:—



1. Cooking-house, 20 ft. by 16 ft.
2. Pump.
3. Storehouse for roots, &c.
4. 4. Boxes, averaging 90 square feet each.
5. Fodder-house, with tank under the floor
6. Passage, 4 ft.

Mr. H. S. Thompson, of Moat Hall, Yorkshire, one of the most skilful

and accurate investigators with whom we are acquainted, made some very important experiments on the relative value of *hot and cold preparation* of linseed. He took two animals, and fed the one on hot and the other on cold food. He had both weighed before he commenced, and both again weighed at the expiration of six weeks. The animal fed on cold food weighed, when put up, 107 stone 11 lbs.; that fed on hot, 108 stone 7 lbs. At the end of six weeks, the first had gained 2 stone 12 lbs.; while the last, the one fed on hot food, had gained 5 stone 1 lb. To guard against the one having any special aptitude to fatten which the other did not possess, he reversed the order; and then it turned out that the animal now fed on cold food, and before on hot, gained 3 stone 1 lb.; while the other, now fed on cold food, gained 5 stone 11 lb.! But this was not all. While the one fed on hot food had only 5 stones 10 lbs. of Swedish turnips per day, the one fed on cold food was not satisfied till his feed was increased to 7 stones of turnips in the same time; thus showing a greater consumption of other food to make up for the want of heat!

CHAPTER VIII.

MEASUREMENT AND WEIGHT OF CATTLE.

Almost every farmer knows that by the use of certain kinds of food the lean frame of a healthy ox will soon become fat; his angular prominences assume a graceful rotundity, and his ribs be hidden in flesh and fat. Yet it is not every farmer that knows how to estimate the gross and nett weight of the animal.

The grazier has two most difficult duties to perform. He has to buy lean animals at a market or fair, and to estimate their feeding qualities; but, above all, he has to calculate the stones he will weigh when he is fat. It is all a money-calculating process. The farmer requires, on the average, to make £5 for summer-grazing an ordinary sized animal. Good grass will feed one beast on an acre, and thus remunerate the farmer. When beef is five shillings per stone, the grazier will require to increase the weight by twenty stones in order to pay him; hence, if he sees a beast which, in his estimation, has frame and capabilities to weigh fifty stones, he ought not to give more for it than £7 5s. But this price will not compensate the breeder; and hence he and the grazier have both to suffer when the price is only

5s. per stone. For such an animal the one will have to take £7 15s., while the other must be content with £4 10s. for grazing, instead of £5.

There are various elements which influence the weight of animals, as breed, age, quality, degree of fatness, quality of food, duration of feeding, &c. Of some of these the buyer may be able to judge; of others he can form no idea. He may conceive the breed to be good, the age to be proper, and the quality superior; he may also find the animal well fed up, both as to quality and food; but he may still be deficient in the requisite knowledge.

The *offals* of cattle have also a material influence in regulating the price. The time was when the hide and tallow would be an ample profit to the butcher; but these are now considerably reduced in price. He must therefore sell the best cuts of meat at more per pound than he gives for the whole, or he will be a loser of his fair share of profits.

The following may be taken as the offal of ordinary beasts:—

	Stones.
Hide, tail, and horns	5
Tallow	4
Head, &c.	2
Heart and eatable portions	11
Lights, liver, &c.	2
Blood	4
Bag and entrails, with contents	14

The *proportion of live weight*, as compared with the quantity of beef, will vary as much as ten per cent. Mr. Ewart, of Newcastle, (a gentleman who has paid very great attention to this subject, and whose slide-rule and cattle-gauge have obtained for him a degree of merit for skill which his labours well deserve,) has drawn up a scale of per centages, which, as his experience and observation are very great, may be taken as the standard of a pains-taking person. He classes animals as to their peculiar qualities, and in his first class includes the following:—

First Class—Short-horns, Herefords, Suffolks, and Devons. Their per centage of fat to live weight is as follows:—

	Beef.		Live weight.
Half fat	55	to	59
Moderately fat	60	„	62
Prime, to very fat	63	„	66
Extraordinarily fat	67	„	70

Second Class.—Craven, Lancashire and Irish short-horns, Lincolnshire, Galloway, Angus, Aberdeenshire, Fifeshire, Norfolk, and better sorts of Welch :—

	Beef.	Live weight.
Half fat . . .	50	to 55
Moderately fat . . .	56	„ 60
Prime, to very fat . .	61	„ 63
Extraordinarily fat . .	64	„ 66

Third Class.—Argyleshire, Highland and mountain breeds :—

	Beef.	Live weight.
Half fat . . .	48	to 50
Moderately fat . . .	51	„ 55
Prime, to very fat . .	57	„ 60
Extraordinarily fat . .	61	„ 66

The above are given with a view to assist the buyer who has not had experience sufficient to enable him to judge of the carcass weight of the animal. Let him have it weighed, and make a deduction according to the above data. It may at least serve as some guide to his inexperienced judgment.

Mr. Stevens, the talented author of "The Book of the Farm," gives two rules for ascertaining the weight of cattle by *admeasurement;* but he confesses that they are not founded on any certain principle, but are completely empirical.

1*st Rule*—Multiply the square of the girth in inches, by the length in inches, and divide the product by 7344, and the quotient will be the weight in imperial stones.

2*nd Rule*—Square the girth in feet, and multiply it by the length in feet; multiply again by the decimal ·238, and the sum is the weight in imperial stones.

By the *length*, in all admeasurement, is intended a line from the top of the shoulder to the setting on of the tail; and the circumference round the body, just behind the shoulders, is the *girth*.

Mr. Stevens very judiciously says, that for beasts between forty and seventy stones the rules of admeasurement apply pretty nearly; but below or above these weights, they cannot at all be depended upon.

Mr. Ewart's slide-rule is by far the simplest and most beautiful of all modes of measurement. The girth is simply set to the length on two lines marked on the wood, and the weight is shown above, according to the class, without the slightest calculation. We have been assured by Mr. Peter Stephenson, of Rainton, a most accurate agriculturist, that he finds it quite accurate enough to depend upon.

We give another and approved rule:—

Measure the girth close behind the shoulder, and the length from the fore part of the shoulder-blade along the back to the bone at the tail, which is in a vertical line with the buttock, both in feet. Multiply the square of the girth, expressed in feet, by five times the length, and divide the product by 21; the quotient is the weight nearly of the four quarters, in imperial stones, of 14 lb. avoirdupoise. For example, if the girt be $6\frac{1}{2}$ feet and the length $5\frac{1}{4}$ feet, we shall have $6\frac{1}{2}$ multiplied by $6\frac{1}{2}$—making $42\frac{1}{4}$; and $5\frac{1}{4}$ multiplied by 5—making $26\frac{1}{4}$; then $42\frac{1}{4}$ multiplied by $26\frac{1}{4}$—making 1,109·16; and this, divided by 21, gives 524·5 stones, nearly, or 52 stones 11 lb. It is to be observed, however, that in very fat cattle the four quarters will be about one-twentieth more; while in those in a very lean state they will be about one-twentieth less than the weight obtained by this rule. The four quarters are little more than half the weight of the living animal; the skin weighing about the eighteenth part, and the tallow about the twelfth part of the whole.

CHAPTER IX.

DISEASES OF CATTLE AND THEIR REMEDIES.

This is perhaps the most unsatisfactory division on which a writer on cattle can pretend to write. There are more cattle destroyed than cured by the strange quackery and drenching pursued by their over-officious owners; and to write anything to encourage a system so ruinous is to perpetuate the evil.

The first thing a dairyman or grazier does is to get a long list of "receipts" inserted in an "*omnium gatherum*" of a book, classified or not, but all under the names of certain diseases. A sow falls ill. She has the yellows, or the staggers, or the worms; not because there is any clear and decided symptoms, but because the owner fancies it is so, and his specific is administered. He watches intently, and no good effect is produced; he runs for another medicine prescribed by another hand; the one opposing, and perhaps counteracting the other. One neighbour looks in, and perhaps another. Each advises a medicine, as empirical as that of the owner, and all must be given, until the symptoms increase and get so bad that the village quack is sent

for, who is more clever than the rest, because he has a larger range of "receipts," and he adds his quota of drugs, until the beast dies, poisoned by medicine!

Now, so long as unprofessional men will continue to prescribe and treat obstinate and complicated complaints; and so long as the public press will pander to the receipt-mania, there is no hope of any amendment. Having had a remarkable instance of the danger attending it, we shall certainly lend no aid to the system. We had a fine year-old short-horn ill. It singled off from the rest, and refused to eat. It drooped its ears, had a dry nose and a staring skin. We saw it was out of health. It was watched, and it voided a watery-like stool. It had the diarrhœa. We gave it cordials and astringents. It got worse. We sent for a skilful veterinary-surgeon. He said it wanted physic. How so?—it was sinking under diarrhœa. No! it was inflammation of the bowels, which were pouring out mucus from the rectum, but the fæces were hard, and bound up in the bowels. He gave it a dose of oil; when it voided hard pellets of dung, and mended. Had we continued the doses with which we commenced, the animal would have been poisoned!

But there are some plain and manifest ailments where the farmer may himself administer simple medicines; and there are some cases of emergency, too, when it may be necessary to do something, till professional aid can be obtained. To these cases we shall advert, and take the complaints in the order of their frequency.

FELON.

This is a complaint common to all kinds of cattle, but especially the tender breeds, although little noticed in the well-known works on veterinary science. It proceeds from cold and exposure, and is accompanied by low fever. The beast is more or less off his food, His coat is staring, his eye dull, his nose dry, and his *back sore*. He will flinch from the touch, and his teeth feel loose. This is an attack of felon. He requires rousing by cordials. Let him be housed, and give him a drink:—1 oz. of turmeric, 1 oz. fenugreek, 1 oz. liquorice, 1 oz. aniseed powder, in a quart of ale; and he will generally recover; if not, repeat the dose. A very common and very safe process is also to divide the nerve of the under side of the tail. This relieves the back, and fastens tho teeth. This operation is thus performed:—Feel for a soft place in the under side of the tail. The knobs are the joints, the soft place is the bone. Cut the skin across at the soft part, and it will bleed for eight or ten minutes. Tie up the tail with a piece of

linen cloth, and great relief will be afforded. This is not mentioned in any work we ever met with; but we have seen its efficacy in hundreds of instances.

HOVEN, BLOWN, OR "OVER-FULL."

Sometimes a change of food, or a feed of wet clover, or potatoes greedily eaten, will induce fermentation in the stomach instead of digestion. The sides will be blown up, until the stomach presses on the skin, with a force which renders it hard to the fingers. For this the probang is by far the best remedy. Introduce it into the stomach by the throat, and the foul air will immediately escape. This instrument is not always at hand, and the beast will lie down; and the disease may continue till the walls of the stomach are ruptured. In these cases an ounce of ammonia will often give relief. A pint of vinegar we have known to effect it; but the safest remedy is a *pint of linseed oil.* It lubricates and opens the orifices of the stomach, and assists the air to escape. Gentle exercise will be useful; but all violence, and, above all, such horrid doses as tar and salt, given with the idea of making them eject their saliva, can only do harm. It sometimes becomes necessary to cut into the stomach—an operation which a veterinary surgeon alone can perform.

CHOKING.

In winter a beast will often get a turnip fast in its throat, which will resist all efforts to force it up or down; and, what is worse, when once this has taken place, the animal will ever afterwards be liable to the same accident. The mouth should first be carefully examined, to see whether the turnip cannot be extracted with the hand, and if it be practicable, this is by far the best mode. If not, the probang, invented by Dr. Munro, is absolutely necessary. Let a little sweet oil be first given to the animal, and then let the probang be carefully and cautiously put down, the cup end downward. If the turnip offers much resistance it must again be withdrawn, and by this its position may be changed. Generally it will go down with a very slight effort, and sometimes it may be got up by running the thumbs up each side of the neck, and gently pressing with the hand.

CALVING.

This, though not a disease, is strictly a subject of medical and surgical treatment; and, though a natural operation, is always accompanied by more or less danger. In old cows, or cows after their first and

second calves, if the right presentation takes place, the calving will be effected without mechanical help. It often happens, that those cows which calve unobserved do the best; and we know a very careful and successful grazier who makes a point of never interfering in ordinary cases. There is certainly more danger from premature assistance than from delay.

The waters are usually the first symptoms of decided labour. A thin filmy bag first breaks. After this the cow will sometimes eat, and seem comfortable for an hour. The second bag is larger and thicker, and envelopes the feet of the calf. When both the feet are there, or one begins to protrude, the other may be sought for, and when both are brought forward, mechanical assistance may be safely rendered, if the head is found between and above them. A cow-tie may be strung round each foot; and the certainty of the head being between them is a signal for a slow and gentle pull downward towards the udder. But, above all things, *give time*. The muscles relax and give way for the calf, if proper time is allowed.

When calving is over, follow the directions formerly given in regard to the management of the mother and produce,—the latter should suck, and the mother lick the calf.

False presentations will sometimes take place;—a single foot, or the head, or the hind legs. In either of these cases, the operator must wait for one of the throes being over, and then gently put back the calf, and introduce his hand, which has been previously oiled, and bring forward the legs which are wanting. If this cannot easily be done, a veterinary surgeon will be necessary. When the hind legs alone are presented, it is only necessary to proceed in the usual way. In cases of difficulty, of malformation in the mother, of water in the head, or monstrosity in the calf, it is always best to call in a veterinary surgeon.

Some parties have the practice of giving every cow a calving drink. We uniformly prefer, as we said, nature's medicine, the licking of the calf, to any and all others which can be given. If it has been a long and protracted labour, a drink of a quart of home-brewed ale, or a pound of treacle, will be found useful. If the cow refuses to lick the calf, which heifers of their first calves will sometimes do, it is seldom necessary to do more than run the hand over the newly-dropped calf, and then pass it across the mouth and lips of the mother.

Abortion is a practice with some individual cows, and is often the result of the presence of blood, or bad smells, arising from putrid

matter decaying near the cow-houses or yards. Once introduced into a cow-house, it often so affects the imaginations of the rest as to become epidemic. Let the cow and the remains of the calf be instantly removed from the rest, and kept alone and quiet. Chloride of lime should be plentifully sprinkled near the stall where she was, and the whole of the herd should have their noses besmeared with tar.

Retention of the Placenta, or failing to cleanse, sometimes occurs; and it requires great care to prevent its retention, when the expulsion does not take place in a few hours after calving. It indicates weakness and want of tone in the uterus. A mild stimulant may be given; and nothing is better than an infusion of camomile flowers, say two handsful in a quart of water, added to a quart of good boiled ale, and, if necessary, apply an injection of soap suds, to keep open the bowels and prevent inflammatory action. If the seat of disease resist all efforts, and begins to putrefy, it will be necessary to consult a veterinary surgeon.

RED WATER.

This is a complaint which frequently attacks cows in summer; and, on some pastures, is of regular occurrence. A dose of eight ounces of Epsom salts, dissolved in a pint of water, if taken in an early stage, will almost invariably set the beast right. If not at hand, a pound of common salt may be given, and the dose repeated, in case of need.

QUARTER FELON.

Inflammatory fever, or quarter-ill, is one of the most obstinate diseases with which cattle may be afflicted; and, though odd instances of cure have been reported, they are extremely few, unless the disease has been attacked in a very early stage. It is also highly contagious, and will sometimes go through an entire herd of calves before they are a year old; for it seldom occurs after that period. The calf gets off its food, and becomes lame or stiff in one foot. The foot may be examined, and no cause of lameness discovered; but soon the disease becomes general; air bubbles are formed between the skin and muscles, and there is a crackling sensation to the hand, on passing it over the skin, especially in the legs. Inflammatory fever is disorganising the body.

Preventatives, as the seton in the dewlap, bleeding in autumn, doses of dyer's madder, &c., are favourite remedies. The seton can do no harm,—it may be tried; but no specific, either remedy or prevention, bas yet been discovered.

FOUL IN THE FOOT.

This is a tiresome worrying disease, to which large heavy milk cows are specially subject. It is to the cow what foot-rot is to the sheep. There is inflammatory action between the claws; it begins to discharge fetid matter, and is a source of pain and irritation, which often dries up the milk, and is frequently a painful and annoying complaint to cure.

Let the foot first be well cleaned and fomented with warm water, and all loose flesh be cut or clipped off. The foot may then be poulticed for one night with linseed-meal poultice, and then again fomented and anointed with tar. If it should smell very offensively, a little charcoal or a few drops of chloride of lime may be added to the water. Next day the inflammation will be relieved, and brought out externally by the tar. The foot may be then dressed with butyr of antimony (chloride of antimony) night and morning, and the tar applied afterwards. The foot should be confined in a boot or stocking, and kept free from dirt. A little salts or linseed oil should be given, to keep the bowels in a state of gentle activity.

MILK FEVER.

This is a common complaint in cows which are deep milkers, at least in summer. Prevention is all that the farmer can adopt. The cure, if any, must be left in the hands of the veterinary surgeon. He must, if he see the udder distended, milk the cow before calving regularly three times a day. She must be kept as cool and quiet as possible, and have mashes of bran only, for a few days after calving. This is cooling and somewhat laxative. If the udder should be hard, which it should not be after this treatment, let it be rubbed with marsh-mallow ointment. A gentle dose of purgative medicine may be given if the cow is in very high condition, and she should be driven a few miles every day before calving. With these precautions there is little danger, at least of its being fatal.

THE YELLOWS, OR JAUNDICE.

This is another form of felon, and is easily distinguishable. White cattle are peculiarly subject to this disease. It makes its first appearance by a yellowness of the eyes and under the anus. The bowels become costive, the teeth loose, the appetite gone, and rapid weakness sets in.

Give—4 oz. common salt, ½ oz. Barbadoes aloes, 1 dr. ginger, 1 quart home-brewed ale, made into gruel.

LOSS OF CUD.

All ruminating animals are sometimes subject to this complaint. The stomach, with a sort of convulsive action, throws the half-masticated food back into the mouth to be rechewed; but sometimes this healthy contractile tone of the stomach is lost. Give—6 dr. Barbadoes aloes, 6 oz. common salt, 3 dr. ginger, 1 oz. all-spice, in a quart of gruel.

INFLAMMATION.

This is a disease known by coldness of the horns and extremities, generally accompanied by much acute and constant pain. All home attempts to cure this disorder will be impotent. A veterinary surgeon should be at once consulted. The same may be said of *staggers*, *stranguary*, and a variety of acute disorders.

PLEURO-PNEUMONIA.

Is only mentioned to say that nothing like a specific has, so far, been discovered. The fearful medicine of a gill of spirits of turpentine and a gill of spirit of sweet nitre, seems to be the most successful but desperate remedy. If the animal is fat, it is by far the best to dispose of it at once, before the flesh gets tainted with the disease. If the animal is lean, remedial measures may be tried; but they are more likely to fail than to be successful.

THE EPIDEMIC.

The disease so named, which affects the mouth with blisters and the feet with pain and inflammation, has lost much of the virulence it possessed from 1839 to 1844; but still it is sometimes troublesome. A dose of Glauber or Epsom salts, in the first stage, with shelter and bran mashes, will generally prevent evil consequences. Should the foot break out, the same treatment that we advised in foul of the foot will be useful.

DISEASES OF CALVES.

If well managed, calves are subject to few diseases; and if starved, neglected, or ill-managed, they will be scarcely kept alive by medicine. The most fatal disease is the *scour* or *diarrhœa*. As it usually proceeds from some foreign or acrid matter in the bowels, a tablespoonful of sulphur in the milk will generally remove it in due time. If it should continue after this, give a teaspoonful of laudanum and a tablespoonful of tincture of rhubarb. We once had a calf nearly dead of diarrhœa. Medicine seemed to have no impression upon the obstinate attack. It was dying. We gave it a bottle of port wine, ex-

pecting it to be dead by morning. In the morning, however, it was well, and crying out for its breakfast. A pint of good old port will often work wonders, when all other remedies have failed, both in man and beast.

COSTIVENESS.

This is sometimes a disease in calves, as well as the opposite extreme. Here it is undesirable to give medicine, unless it be very severe. A handful of onions, boiled with an ounce of fat bacon, is by far the best remedy. It never does injury, but is nutritious even to the healthy animal.

GRIPES.

Is a complaint to which young calves are subject which have had sour milk given to them; and there is often acute pain exhibited, kicking of the belly with the hind legs, pawing, &c. A cure is generally effected, in a remarkably short time, by a cupful of peppermint water and a teaspoonful of laudanum.

The great secret of keeping all animals is, to tend them carefully, and keep them well. Let the land which is thought to be subject to disease be well drained and better farmed; let the bad herbage and cold beds of the cattle be cured, and they will be healthier and thrive better. It is safer always to pay the cake-crusher or the miller than to pay the veterinary surgeon, however skilful he may be.

In conclusion, use the cow well, and she will be grateful. Let all your treatment be dictated by humanity and kindness, and a more patient and grateful servant you cannot have.

THE END.

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